



## Professor Rainer Glaser

University of Missouri

### **‘Scientific writing and authoring’ instruction at the University of Missouri and the University of Chinese Academy of Sciences**

*Dr. Rainer Ernst Glaser, Professor of Chemistry, studied chemistry and physics in Tübingen (Chem.-Dipl., 1984), at Berkeley (Ph.D., 1987), and at Yale (post-doctoral fellow, 1987-9). Glaser is a broadly interested physical organic chemist and his group has published over 160 papers with support by ACS-PRF, NSF, and NIH. Glaser has always valued and enjoyed extensive collaborations with chemists, biochemists, physicists, mathematicians, astronomers, educators and journalists. In 1995, Glaser began his education research with the novel curriculum, *Chemistry Is in the News (CIITN)*, which he designed for chemistry education of science majors. The NSF funded CIITN*

*project integrates science content with science context and science communication. With the subsequent NSF funded project *Mathematics in Life Sciences* he took an important step to more interdisciplinarity and especially to the integration of mathematics in science education. Glaser’s most recent educational initiative, the development of a curriculum for the instruction on *Scientific Writing and Authoring* embraces the spirit of CIITN and more fully integrates quantitative analysis into science education. The curriculum was developed for a writing-intensive, upper-division undergraduate seminar course taught at the University of Missouri in Columbia (MU). *Scientific Writing in Chemistry* integrates content, context, collaboration and communication and, in fact, the curriculum addresses an essential need for science students across the globe. Since 2010, Glaser has taught an adaptation of the *Scientific Writing* curriculum in the Summer School Program of the University of Chinese Academy of Sciences in Beijing (UCAS). Glaser was a Fellow of the Japanese Society for the Promotion of Science (JSPS) in 1997 at Hokkaido University, Sapporo. Glaser was elected Fellow of the American Association for the Advancement of Science (AAAS) in 2004 and Fellow of the Royal Chemical Society in 2006. He was a Visiting Professor at the Institute of Chemistry of the Chinese Academy of Sciences in Beijing in 2013 and 2014 and a Guest Professor at the Department of Chemistry of Northwest University in Xi’an in 2014.*

The development is described of a *framework* for an assignment-based curriculum to instruct student on best practices in writing a scientific paper, about the scientific publication process and peer review, and about professional issues. The rationale for the curriculum design is that students should not only understand scientific content and methods but they should also experience peer review as an integral and essential part of the process of science. The curriculum *Scientific Writing in Chemistry* integrates content, context, collaboration and communication and addresses an essential need for science students across the globe. Each implementation employs a new curriculum, which is based on an overarching *theme*. The themes are selected to address timely science topics that are pertinent to macroethical discussions in society. All assignments are original with adapted online resources and rubrics for assessment. The assignments, associated data and sources, peer review devices including assessment rubrics, and samples of completed assignments are available online on the course web sites and their URLs are provided as footnotes to the Table 1. We will argue that the context-rich, interdisciplinary orientation of this curriculum exemplifies the goals of the Next Generation Science Standards.

The curriculum was developed for a writing-intensive, upper-division undergraduate seminar course taught at the University of Missouri in Columbia (MU) and taught in the Spring Semesters of 2010 - 2015. We will report on the design of this curriculum and on results of evaluation. We will also describe an adaptation of the semester-long MU course to the Summer School Program of the University of Chinese Academy of Sciences in Beijing (UCAS). The differences in scale and mode of delivery posed several non-trivial challenges. Enrollment data and results of evaluations collected over three years (2011 – 2013) are presented to demonstrate the success of the adaptation. It is hoped that this course adaptation will contribute to the wide and open dissemination of this *Scientific Writing* curriculum and, more generally, that the example of the adaptation might encourage outstanding experts from many science, technology, engineering and mathematics (STEM) fields to contribute in a significant way to international education. ■

**Table 1.** Themes and Enrollments at MU (Spring) and UCAS (Summer)

Year	Theme	MU	UCAS	
			Course #1	Course #2
2010 <sup>a</sup>	Aspirin and other Painkillers	32	289	-
2011 <sup>b</sup>	Dyes, Indicators & Chemical Sensors	25	108	92
2012 <sup>c</sup>	Soaps, Detergents & Ambiphiles	36	118	54
2013 <sup>d</sup>	Solar Energy	32	197	84
2014 <sup>e</sup>	Nutraceuticals: Sources & Functions	34	168	107
2015 <sup>f</sup>	Photocatalysis	32		

(a) SP10: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP10.html](http://faculty.missouri.edu/~glaserr/RG_T_SP10.html). (b) SP11: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP11.html](http://faculty.missouri.edu/~glaserr/RG_T_SP11.html).  
(c) SP12: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP12.html](http://faculty.missouri.edu/~glaserr/RG_T_SP12.html). (d) SP13: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP13.html](http://faculty.missouri.edu/~glaserr/RG_T_SP13.html).  
(e) SP14: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP14.html](http://faculty.missouri.edu/~glaserr/RG_T_SP14.html). (f) SP15: [http://faculty.missouri.edu/~glaserr/RG\\_T\\_SP15.html](http://faculty.missouri.edu/~glaserr/RG_T_SP15.html).

- (1) Glaser, R. E. (2014). Design and Assessment of an Assignment-Based Curriculum to Teach Scientific Writing and Scientific Peer Review. *Journal of Learning Design*, 7, 85-104.
- (2) Carson, K. M., Hodgen, B., Glaser, R. E. (2006). Teaching Dissent and Persuasion. *Educational Research and Reviews*, 1, 115-120.
- (3) Carson, K. M., Glaser, R. E. (2009). Chemistry Is in the News: Assessing intra-group peer review. *Assessment & Evaluation in Higher Education*, 34, 69-81.