

Chapter 2

STEMing the Tide: Writing to Learn in Science

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EXECUTIVE SUMMARY

The goals of STEM education are similar to the Writing Across the Curriculum (WAC) movement, and they complement each other in best educating students for their futures in the workforce or academia. In this chapter, the authors describe ways in which science teachers may use writing to reach the goals of STEM education.

INTRODUCTION

STEM education shares similar goals to the Writing Across the Curriculum (WAC) movement, and they complement each other in best educating students for their futures in the workforce or academia. In this chapter we describe ways in which science teachers may use writing to reach the goals of STEM education. Although we will be using a specific science course for most of our examples, the concepts may easily be applied to other science courses to encourage students to “invite our children to look at their school work as important to the world” (TIES, 2011). We will focus on collaborative learning, writing-to-learn, and problem solving activities to develop critical thinking skills that integrate science, technology, engineering, and mathematics within a personalized context.

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BACKGROUND OF WRITING ACROSS THE CURRICULUM

The WAC movement had its beginnings in the work of James Britton, Nancy Martin and their colleagues at the University of London's Schools Council Project in the 1960s and 1970s. They studied "language across the curriculum" in English schools and concluded, "in theory and practice language was integral to *learning* as well as to *communication* in all disciplines" (Farrell-Childers, Gere & Young, 1994). When this concept moved across the Atlantic, supporters of WAC in the U.S. were concerned about two things: students' ability to communicate and their "abilities as learners, critical thinkers and problem solvers" (Farrell-Childers, Gere & Young, 1994). Those first-generation WAC programs believed writing as a tool for learning would help achieve these goals. By the 1980s, teachers and scholars expanded that purely cognitive approach to WAC to include social dimensions as well. Therefore, WAC involved not just learning and written communication, but also writing as a social process that takes place in a social context. "If we want students to be effective communicators, to be successful engineers and historians, then we cannot separate form from content, writing from knowledge, action from context" (Farrell-Childers, Gere & Young, 1994). These ideas also have run through the STEM education program (American Association for the Advancement of Science, 2011) just as WAC programs began to stress the role of collaboration in learning, of audience in communication, and of social context in learning to write and writing to learn. Another similarity has been that the social environments of classrooms have changed to nurture and challenge students to advocate the way individual classrooms were connected to other classrooms within schools and to larger social networks of community, district and state. A fourth premise included social action in which students supported further personal and social goals well beyond the classroom. Since those early years, WAC has expanded as a movement to include all communication across the curriculum--reading, listening and speaking skills--because it is an "inclusive and evolving movement" (Farrell-Childers, Gere & Young, 1994). Just as with STEM education initiatives, the successful programs have been ones that have attained support at all levels of the system and encouraged innovative teaching and learning practices.

In the 2011 policy research brief, "Reading and Writing across the Curriculum," the National Council of Teachers of English describes the benefits of a reading and writing across the curriculum program to enhance student achievement in all subjects. In one study reading and writing are essential to learning because students have needed "strategies for reading course material and opportunities to write thoughtfully about it" in order to master concepts in all disciplines (Allington, 2002). However, the brief acknowledges that student achievement is enhanced by teachers who focus on helping their students develop strategies for reading and writing in their specific

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