



Dealing with Resistance to WAC in the Natural and Applied Sciences

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Introduction

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The University of Missouri's Campus Writing Program (CWP) is the fourteen-year-old brainchild of an interdisciplinary task force charged with addressing the writing needs of undergraduates beyond first-year composition. Its beginnings were modest. In the fall of 1985, the Program had a director and three writing-intensive (WI) courses; it now has seven full-time employees and offers about two hundred WI courses annually. The Campus Writing Program is a thriving, nationally recognized program, and yet its assumptions continue to be challenged from time to time, particularly by faculty in the natural and applied sciences. Some of these skeptics are, perhaps, just curmudgeons who are best ignored. Other skeptics, though, embody the very critical spirit that is advocated by the Campus Writing Program and need to be taken seriously.

We WAC theorists and practitioners admire those scientists who challenge us to be accountable for our claims that writing improves thinking and is a valuable way to learn course content. Where are the hard data? What sort of credentials do WAC proponents have? How justified are we in making suggestions to experts in other disciplines? WAC research needs to answer these questions and others. To effectively meet the concerns of skeptics, though, something else is needed first. The most powerful initial response to scientists' skepticism comes not from WAC literature, hard data, or credentialed spokespersons, but from the local positive experiences of peers. Sharing these experiences—perhaps through one-to-one conversations, through brown-bag seminars, through faculty workshops, or through conferences such as the biennial National WAC conference—is necessary to encourage skeptics to risk the experiment and find out for themselves what does and doesn't work. In this essay, three Campus Writing Board members and experienced WI teach-

ers from mechanical engineering, nursing, and natural resources share their perspectives on resistance to WAC.

Faculty Resistance: An Engineer's Perspective

Aaron Krawitz, Department of Mechanical and Aerospace Engineering

Shortly after MU faculty voted to implement the WI course requirement, I participated in one of CWP's three-day workshops to introduce faculty to WAC methodology. My appreciation of WAC began when I realized, at the workshop, that the critical-thinking assignments that are so much a part of WAC parallel the process I go through in my own research. I recall being struck by the awareness that I was working professionally in one mode and teaching in another. I introduced WAC concepts into my courses gradually and later formally applied for and received approval to offer a WI course.

I take WAC to mean writing to learn, a means of promoting critical thinking about the ideas in a course and, by extension, an approach to the discipline in general. It is not learning to write, which engineering faculty would call technical writing. Although employer surveys consistently cite lack of communication and critical-thinking skills, engineering faculty and the College of Engineering have been slow to recognize the role WAC could play in developing these skills. Why is this the case and what can be done to address the resistance to using this valuable pedagogical method?

The Rationale for the Resistance

Engineering's four-year undergraduate program culminates in a professional degree. Its professional focus distinguishes it from the traditional liberal arts, and its undergraduate degree distinguishes it from other professions like law, medicine, and architecture, which are post-baccalaureate. This inherently vocational character of engineering is at odds with the liberal arts tradition, which is more intellectual than vocational. I believe this difference accounts for the fundamental origin of faculty resistance to WAC in our courses. Traditional engineering education focuses on mastering procedures and methods, while critical thinking, which is the core of WAC, deals with ideas. Some of the ways this vocational mindset manifests itself in resistance to WAC are:

The "culture" of classroom teaching is strongly entrenched: lectures, problem sets, tests, labs. Although some institutions have used new and even radical approaches, old patterns are deeply ingrained. Faculty broadly perceive them to work well: "What's wrong with the way we've always done it?"

Engineering faculty, like most faculty, are trained to be professionals in their fields, not teachers. Because of engineers' vocational

mindset, we are particularly vulnerable to a lack of respect for learning theory and pedagogical methodology: “It’s ‘foo-foo stuff’ that belongs in the soft sciences and humanities.”

The reward structure in engineering, at least at Research I universities, has a clear priority: research supported by external funding. The teaching component of tenure requirements carries insufficient weight. The same is true for the teaching component of annual evaluations; in MU’s College of Engineering, WI courses are not acknowledged as being different from “regular” courses.

Perhaps most importantly, there is simply a fundamental lack of understanding about writing to learn, as encompassed in: “I’m not trained to teach writing”; “Students should learn writing in a special class”; “I don’t have room for writing assignments in my course”; “Reasonable people can’t disagree on diffraction stress measurements.” These misperceptions can, of course, be addressed one by one: Critical thinking, not technical writing, is the point. Writing should be integrated into course content, not add-on assignments. And, if reasonable people can’t disagree on the subject of diffraction stress measurements (my specialty), why did I spend a year revising a manuscript? However, while piecemeal efforts are necessary to address all these forms of resistance, a more global strategy is required to change the culture.

Dealing with the Resistance

I believe the best approach to addressing engineering’s resistance to WAC is to reinforce the idea that professional development for student engineers is enhanced by WI assignments. As a profession, engineering requires critical, independent thinking and effective communication. Employers strongly support the development of these skills in prospective employees. The syllabus for my WI course includes the statement, “Engineers are called upon to present ideas, arguments, and analyses in verbal and written forms. In your jobs, you will write memoranda, reports, planning documents, justifications, etc. Because of the technical nature of engineering, and the financial and legal consequences of your work, you will probably be asked to present more ideas in writing (and verbally) than most graduates of our campus. Conventional classroom assignments do not represent the real world. Your boss won’t give you quizzes, problem sets, or exams. You will deal with open-ended problems and issues. You will deal with situations which require higher-level critical thinking, not a ‘plug and chug’ approach.” My students don’t find it a hard sell.

Although employer surveys cite lack of critical thinking and communication skills, engineering faculty persist in expecting others to provide the solutions. WAC could contribute to resolving these shortcomings in our students’ education. The following suggestions could assist

in dealing with faculty resistance to WAC pedagogy in the engineering curriculum.

Make presentations to industrial advisory boards. Our engineering departments, as well as the college, have advisory boards comprised of industry representatives who can bring pressure to bear. Presentations to them about WAC's contributions to the development of critical thinking and communication skills could be very effective. These would best be done by engineering faculty, but WAC personnel could be present, contribute, or provide a separate, more global presentation.

Offer WAC presentations, similar to the above, to existing faculty and student seminars.

Hold a WAC workshop specifically for engineers. CWP has been trying to initiate such a workshop at MU for some time. If the college's advisory board expressed interest, it would go forward much faster.

Encourage interested engineering faculty to develop a study group in which they could share pedagogical approaches, experiments, trials, and errors.

Invite faculty to informal activities to discuss teaching and learning such as the brown-bag lunches and occasional short workshops sponsored by CWP.

Have engineering faculty who have successfully employed WAC strategies provide examples of their syllabi and writing assignments. One of the hardest hurdles to overcome, even after a faculty member has expressed interest in offering a WI course, is creating the assignments and grading criteria.

Some engineering colleges have tried new, experimental curricula. Some have developed sophisticated multimedia course materials. But these are time- and cost-intensive. And the development of critical thinking through writing has not, in my experience, been a major focus of such efforts. Resistance persists. Given the pressure on most engineering colleges to include more procedures and methods in the curriculum, coupled with a traditional emphasis on research, engineering faculty are not likely to mount extensive curriculum revision efforts. A major appeal of WAC is that one teacher in a specific class can have an impact; it can transcend specialized curricula and unavailable or hard-to-develop methodologies.

Recasting an Engineering Assignment into WI Form

One example of how a traditional engineering assignment can be structured as a WI assignment is this one from my Composite Materials course. It is the first assignment students encounter, solvable using ideas learned in a sophomore-level course. The WI version, however, anticipates many ideas important to the nature of reinforcement in composite materials:

Conventional version:

Consider a cylinder of tungsten (W) surrounded by aluminum (Al). Let the force on the total cross-section ($A = 1 \text{ cm}^2$) be $F = 2 \times 10^4 \text{ N}$. Also, $E_W = 400 \text{ GPa}$; $E_{Al} = 70 \text{ GPa}$; and, $A_{Al} = 5A_W$.

Determine:

The forces F_{Al} and F_W

The stresses s_W and s_{Al}

The strain e

Writing Intensive version:

The Nature of Reinforcements in Composites

Consider a cylinder of tungsten (W) surrounded by aluminum (Al). Let the force on the total cross-section ($A = 1 \text{ cm}^2$) be $F = 2 \times 10^4 \text{ N}$. Also, $E_W = 400 \text{ GPa}$; $E_{Al} = 70 \text{ GPa}$; and, $A_{Al} = 5A_W$.

Determine:

The forces F_{Al} and F_W

The stresses s_W and s_{Al}

The strain e

Discuss the significance of your results. Consider the following:

How does the notion of reinforcement enter in, i.e., what is the role and effect of the tungsten with respect to the aluminum?

Explore this further. If there were no reinforcement so that the total cross-section was pure aluminum or tungsten, how would the stress and strain compare?

What are the implications for the interface between the tungsten and steel?

What roles do the stress-strain curves of the individual materials play?

Write no less than one nor more than two pages, double-spaced, 12-point font. All aspects of your paper should be prepared on a word processor, i.e., text, equations, figures, tables.

This assignment has been reasonably effective in encouraging students to think about the physical implications of the topic, as well as in introducing students to the WI process. Some “get it” quickly but most are uncertain about the open-endedness of the questions and the concept of working through ideas rather than just cranking out numbers, whose magnitudes, units, and physical meaning they often ignore or do not understand.

Resistance to WAC in engineering is understandable. But there are ways to deal with it, grounded in the highly utilitarian lessons WAC can contribute to educating practicing engineers. There will continue to be a cadre of WAC proponents among the faculty who will, even if small in number, reach many students through specific courses. High-level administrative support helps, too, as do graduation requirements. The enrollment in my elective course has increased, for example, now that MU requires that at least one WI course be in the major. Because engineering students feel more comfortable in “their own” courses, they like being able to fulfill both WI requirements in engineering even though only one must be. In short, the culture can be altered and already has been to some extent. The key to dealing with the deeper resistance, however, lies in conscientiously implementing the points above.

Multiple Sites of Resistance: A Nursing Perspective

Kay Libbus, School of Nursing

A dichotomy similar to the one Aaron describes in engineering holds for nursing as well. Nursing is still viewed by many students and their parents (and regrettably some faculty) as a vocational training program rather than an academic course of study that requires scholarly activity. The conflict between the intellectual and the vocational is ongoing in nursing education. But the clients of nursing practice are human beings, who have a profusion of physiological, psychological, and social variations and deficits. The focus of nursing practice is to assist clients in overcoming these deficits. By its very nature, nursing practice must be considered a creative activity. It cannot be accomplished by protocol or formula. Judgment is required. The algorithmic approach to nursing practice is seldom effective or appropriate. The nursing process—assessment, planning, intervention, and evaluation—demands critical thinking and the ability to synthesize and analyze information. WAC philosophy and WI courses offer a powerful, if partial, means for educating students to be sound practitioners of nursing.

Student Resistance

Multiple sites of resistance exist, though. First are the nursing students whose petitions to waive the required WI nursing course I re-

view as chair of nursing's admissions and progression committee. Of course, I deny them. Even though nursing attracts many "nontraditional" students, most are recent high school graduates who are not entering the clinical major as independent, autonomous thinkers. And while the program is highly competitive and the students unusually bright, they are also very concerned about grades. They come to prize courses in which they can memorize information and, in turn, feed it back on objective examinations. Students prefer straightforward, somewhat simplistic questions. Few students encounter messy, open-ended problems in their early coursework (apart from the prerequisite WI course); they do not yet know that the majority of nursing practice requires solving complex problems that have no single right answers.

Additionally, most students come to the clinical nursing major with well-established career goals; many have preselected critical and emergency care, which demands sophisticated psycho-motor skills. Students seem willing to tolerate classes which teach the theory and performance of these skills, but they have little patience for less well-defined coursework. They do not anticipate facing the ethical or legal issues while delivering this care, nor do they consider the research necessary to support such highly sophisticated care.

Moreover, because nursing students go through the program as a class, they come to know one other well and develop their own "culture." While this sense of community is positive in many ways, it contributes to a resistance to doing things "differently" and to learning in new ways. And finally, although nursing is changing, it is still a female-dominant profession in an uneasy relationship with the still male-dominant medical profession. This exacerbates many nursing students' progress in coming to terms with authority, autonomy, and independent thinking.

Curricular, Faculty, Institutional, and Professional Impediments

MU nursing students take the required nursing WI course their junior year, when they are already carrying a heavy course load and are simultaneously involved in their first clinical experiences. Their desire for expediency is somewhat understandable and the addition of a WI course confuses and annoys them. They're not sure they want to learn research methods and legal and nursing ethics—and they are quite sure that they do not want to write about them.

In general, writing is limited in undergraduate nursing education. No major papers are required at MU until the capstone experience in the final semester, and even that is a group effort with no drafts or revisions. Moreover, because clinical charting is strictly formulaic (e.g., SOAP, for subjective, objective, assessment, plan) and critical-care charting is increasingly done by exception (nothing is charted if there have been no

changes during the shift), nursing students are actually discouraged from writing.

Another source of resistance to WAC derives from a disciplinary and professional issue within nursing—objective examinations. The national licensure exam required for all types of RN programs, the NCLEX, is objective. Students do not see WI courses as effective in preparing them for the NCLEX as traditional courses are. Many nursing faculty believe their responsibility lies in helping the students pass the examination, preferably on the first attempt; their resistance, too, stems from believing that WI courses do not contribute to preparing for the exam. Moreover, one of the evaluative parameters for schools of nursing, including MU, is the percentage of students who pass the NCLEX.

As a result, nursing students become well schooled in taking objective exams and, as a further consequence, are misled into assuming that clinical practice can be accomplished by finding the single “right” answer. Students’ resistance to independent thinking thus inhibited, the issue is further compounded because students receive overly simplified clinical experiences that facilitate quick learning. Rarely do students encounter truly complex client care problems or need to manage care for multiple clients.

Institutional factors also complicate teaching WI courses. A number of MU’s tenure-track nursing professors are still completing their doctorates. While some of these faculty may be philosophically aligned with the goals of WAC, many have practical conflicts with the time demands of teaching. When those time conflicts are intensified, it is tempting to have graduate students assume a disproportionate share of evaluating student papers. Faculty lose control of the grading process, which may lead to inadequate or inappropriate feedback to students. This is particularly problematic when no norming is done and graduate teaching assistants grade differently; student confusion, resentment, and increased resistance result.

Despite these multiple sites of resistance and impediments—all of which must be acknowledged and dealt with—WAC and WI courses offer a way to bring more critical thinking and open-ended problem-solving into the nursing curriculum. WI courses are a means of propelling nursing students from positions of relative passivity to positions of greater autonomy in thinking and, we hope, in practice. A number of the suggestions Aaron outlines might apply for nursing as well as engineering, and it would behoove us to try them. At the very least, our department continues its custom of encouraging nursing faculty to attend CWP’s WAC workshops, and we continue to support WAC’s goals for our students’ learning.

Resistance as a Symptom of a Larger Malady

Mark Ryan, *Fisheries and Wildlife*

I see science faculty's reluctance to become involved with WAC as a specific expression of a more comprehensive problem—resistance to Teaching Scholarship. College and university instructors hesitate to use writing-to-learn approaches for the same reasons they are reluctant to adopt any of several innovative pedagogies that promote active learning and critical thinking. Faculty are slow to abandon traditional teaching techniques like lectures, unrevised term papers, and objective examinations and to use discussion-based instruction, collaborative learning groups, or problem-based learning instead.

To overcome this resistance, we first must grapple with the underlying resistance to Teaching Scholarship. To be sure, there are specific forms of resistance to using writing-to-learn, just as there are specific roadblocks to using, say, role-playing in the classroom. But, addressing the fundamental resistance to a myriad of cutting-edge pedagogies is essential to gaining widespread acceptance of WAC.

Is Teaching Scholarship?

Perhaps the broadest reason for resistance to Teaching Scholarship is that many faculty simply do not perceive teaching as a form of scholarship. Ernest Boyer's *Scholarship Reconsidered: Priorities of the Professions* (1990) interprets the commonly accepted paradigm of academic scholarship as first, and most essentially, research in a discipline. Teaching and service are functions that grow out of scholarship but are not part of it. Boyer shows, however, that knowledge does not necessarily develop in this hierarchical manner. Rather, he notes, practice can lead to theory as well as the reverse, and teaching can shape both practice and research. He argues that the work of modern professors has four separate but overlapping functions: the scholarship of discovery, the scholarship of integration, the scholarship of application, and the scholarship of teaching. Boyer believes that the work of academics is consequential only when it is understood by others. Teaching, he says, is scholarship when it both educates and entices future scholars. He sees teaching as a dynamic endeavor that involves "... all the analogies, metaphors, and images that build bridges between the teacher's understanding and the student's learning" (page #?).

Boyer believes that teaching which embodies creative pedagogy, stimulates active learning, and fosters creative, critical thinking provides a basis for future learning and growth. Far more than merely transmitting information, he holds, teaching should transform and extend knowledge. In some academic sectors, Boyer's ideas have already been debated, reshaped, adopted, or rejected. But for many of our colleagues in the sci-

ences and engineering, his precepts remain unknown. Boyer's ideas have not even been introduced to the debate. Bringing the scholarship of teaching to light is an essential first step in reducing resistance to new pedagogies, especially WAC.

The Many Forms of Resisting Teaching Scholarship

Traditionally, teaching has been the sole purview of the practitioner. Determining course content, style of delivery, exam formats, and the like has been sacrosanct. Certainly, curricular issues are dealt with at department, college, and campus-wide levels, but specific course design is usually left to instructors. Pressure to adopt new methodologies seems to infringe on the personal space and power many college faculty have come to expect. This is especially noticeable for WI courses at our institution. Despite CWP's focus on faculty volunteers, teachers are occasionally assigned to teach WI courses. Without intellectual buy-in, resistance by "delegated" faculty (and those who know them) is assured and intensified.

For some faculty trying new pedagogies, the loss of power is profound. In *The Skillful Teacher* (1990), Stephen Brookfield notes that classical lecture-based instruction—where teachers "give" students knowledge—maintains teachers as powerful, authoritarian figures. Abandoning teacher-based learning for student-based learning (in such formats as peer-teaching or writing-to-learn) requires teachers to give up power, to no longer be "the sage on the stage."

Scholarship in any form necessitates some type of evaluation or peer-review. In Teaching Scholarship, evaluation is commonly perceived as a threat. Even faculty accustomed to peer-review of research are uneasy or intimidated by critical examination of their teaching. Many faculty who have spent decades training as research scholars, usually with mentors, have honed their teaching methods in an isolated, nonmentored environment. To have years of unevaluated effort suddenly open to scrutiny is ego-threatening. MU faculty express grave concerns about teaching peer-review. If critiques of teaching scholarship are left to administration or to a faculty "teaching elite," true peer-review will not occur and opposition among faculty will solidify. Engaging all faculty in the process of developing equitable, consistent peer-review procedures for all forms of teaching will aid in overcoming resistance to Teaching Scholarship.

The difficulty inherent in adopting new teaching styles and having them exposed to peer critique is exacerbated by the real or perceived lack of know-how by teachers. Many of my colleagues in the sciences and engineering complain that they are not trained to teach writing. At MU, faculty attend WAC workshops prior to teaching WI courses. Such training is critical to overcoming fears of inadequacy. For most faculty who

have attended such workshops, WAC is less about learning to write than it is about learning discipline-based content. It's important to remind faculty that, as research journal reviewers and editors and thesis evaluators, they regularly "teach" the writing standards of their professions. It's also important to have a well-staffed writing center, so faculty are reassured that a back-up support system is available for them and their students when issues arise that they aren't comfortable with.

By far the most pervasive and problematic reason for resistance to Teaching Scholarship is the lack of rewards associated with such scholarship. Too often administrators are blamed for lack of reward for teaching excellence. To be sure, administrators can be naive about teaching scholarship. But in faculty-based tenure-and-promotion or merit-salary review processes, faculty's valuation of teaching scholarship is often as low or worse than that of administrators. Working to overcome this enormous roadblock is paramount to addressing the resistance WAC and other innovative pedagogies face. WAC programs and their associated faculty must promote the recognition, documentation, and yes, quantification of teaching scholarship. Assisting faculty with the development of effective teaching portfolios, promoting peer-review of writing assignments (or other learning techniques), and developing juried competitions for writing assignments (similar to the juried shows artists and musicians rely on to document their performance scholarship) are options that should be pursued vigorously by those committed to enhancing Teaching Scholarship.

Beyond the use of formal evaluation in the academic review process, such procedures can also form the basis for institutional recognition for Teaching Scholarship. Never underestimate the ego of an academic! Prestige is a powerful motivator. Even without tangible rewards (e.g., above-average salary increases), many faculty will be less resistant to adopting new teaching methods if they see positive recognition of their efforts as a real possibility. With recognition and accumulated prestige will come greater acceptance of Teaching Scholarship throughout all of higher education. And that, in turn, will transfer back into the tangible rewards currently lacking.

Progress in reducing resistance to Teaching Scholarship, including WAC inquiry, will be slow. Universities and colleges, like other bureaucracies, change when pressures to do so are seen as important to protecting the future of the bureaucracy. Pressure from within, such as widening the celebration of teaching scholarship, is important. But pressure from outside the academy often produces swifter change. We must identify the beneficiaries of teaching scholarship in general, and WAC specifically, and encourage those beneficiaries to articulate their stake in promoting and rewarding such scholarship. Alumni, employers, parents (voters!), and legislators routinely emphasize the overwhelming importance of qual-

ity instruction in higher education. Their demands to develop, improve, and recognize teaching scholarship could go a long way to overcoming internal resistance to new pedagogies and their application in our institutions.

Future Considerations

Martha A. Townsend, English, and Director, Campus Writing Program

The nature and sources of resistance to WAC philosophy are daunting. The issues that Aaron, Kay, and Mark raise are not easily resolved; in fact, these issues constitute many of the “traps for the unwary [that] usually leads to an unimagined fiasco” which Ed White cautions about in *Teaching and Assessing Writing* (1994, 161). But as Marty Patton suggests in her introduction, some of these challenges are appropriate. And some of the issues don’t so much require a once-and-for-all resolution as they do continual negotiation through institutionally supported channels of communication. What are some of the ways these channels operate that have allowed WAC to achieve its fourteen-year longevity at MU?

Aaron alludes to the need for high-level administrative support. Remarkably, MU’s Program has benefitted from generous administrative support from the outset, both philosophically and financially. At the same time, however, “ownership” of the program has always rested in the hands of faculty. A dedicated, conscientious core of eighteen faculty—including Aaron, Kay, and Mark—comprises the Campus Writing Board, the policy-making body that peer-reviews WI course proposals. Made up of faculty representing all sectors of the university, the Board ensures flexibility in WI guidelines so that various disciplines can meet their own needs; however, the Board also maintains the integrity of the WI requirement by establishing parameters for rigorous instruction.

Also, Board members and CWP staff understand that WAC and WI courses are integrally tied to four of MU’s central missions: undergraduate education, graduate education, faculty development, and research. We work to articulate and reinforce those missions in a variety of ways. Examples include the WAC workshops and informal activities mentioned above; letters of support based on WI teaching for faculty nominated for teaching awards; nominations of graduate teaching assistants (who work with WI faculty) for the Graduate School’s annual teaching awards; support for faculty and graduate students to attend professional conferences when they are presenting WAC- and WI-related papers; a CWP-developed and -taught “Computer Information Proficiency” course (titled “Composing with Technology”) for MU’s General Education Program; and a campuswide publication featuring these initiatives as well as innovative WAC and WI accomplishments.

Some preliminary signs of encouragement are appearing on the national horizon. The third National WAC Conference in Charleston (where Aaron's, Kay's, and Mark's presentations were first made) drew that meeting's largest and most enthusiastic participation ever. Methods for evaluating Teaching Scholarship should receive new emphasis with the release of *Scholarship Assessed: Evaluation of the Professoriate* which continues Ernest Boyer's earlier ideas. In addition to having held six successful annual conferences, The American Association for Higher Education's Forum on Faculty Roles and Rewards has released a series of documents, titled the "New Pathways Working Papers," many of which tackle the national-level problems Mark alludes to in his remarks. And organizations like TIAA-CREF are finding ways to recognize innovative general education programs, as they did with MU in 1997, through the prestigious Hesburgh Award. Such awards aid institutions in publicizing their undergraduate educational reforms which, in turn, increases public awareness and public support for continued improvement.

But those national signs of hope are preliminary. And whatever promise they hold seems very far removed from the day-to-day resistance WAC faces on our campuses as we do our work. As long as colleagues, departments, and administrators can continue to maintain the critical spirit and collegial negotiation that has characterized MU's program so far, we remain optimistic.

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