

# Mathematics and Interdisciplinary Culture: Overcoming Inertia

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## Abstract

After several years of ‘sweat and tears,’ we of the Project Intermath consortium still must ask ourselves, “Have we been successful?” This paper, while acknowledging significant successes, addresses some key areas which still impede our efforts at cultivating mathematics education reform. Taking a little ‘literary license’, the author looks at attitudes, habits, convenience and the matter of time management (overload) as current impediments on our road to success. Unfortunately, there are more questions than answers.

**Introduction:** It all started around the end of the 80’s. Project Intermath was borne ancillary to initiatives to effect mathematics reform across the United States. The need for better communication between the mathematics community and those of other disciplines had long been recognized. Through use of the Interdisciplinary Lively Application Project – the ‘ILAP’ – a model for cooperation was proposed to the National Science Foundation. Its acceptance led to the formation of a consortium of interested schools in which the ILAP was the basic tool by which we would realize a world in which mathematics would be a ‘pump’ to other disciplines rather than a ‘filter.’ It is now time to ask the question, “How far along the road have we traveled in our quest for mathematics reform?” As is too often the case, the answer lies in a series of ‘good news – bad news’ situations. We have achieved some outstanding successes. Without going into details, we have managed to ‘hit the target’ in cases such as:

- Mathematical Modeling Contests
- Development of ILAPs by the hundreds
- Specific institutions fully embracing the concept of the ILAP and interdisciplinary communication.

At the other end of the spectrum, however, is the fact that, from this author’s perspective, our successes are still somewhat localized; in effect, we have made progress, but we have not seen a robust national movement towards improved communication between the mathematics community and those of other disciplines. Hopefully, those ‘enclaves’ of success will continue to grow. To do so will require that we overcome some roadblocks in terms of what might be called ‘Interdisciplinary Culture’ inertial systems. Of course, the word ‘culture’ is central to and the lynchpin for this discussion.

**The Notion of Culture:** As an ‘old soldier’ the author chooses a military analogy for describing the problems related to culture and reform (of any type). Now that your appetite to read further has been whetted, let’s digress for one moment and look at the definition from the New World Dictionary of the American Language:

**Culture: The ideas, customs, skills, arts, etc. of a given people in a given period.**

While the definition above describes some of the components of human culture, it does not provide the ‘experience’ of living in a culture different from one’s own culture. Unless we understand, and accept, where other people are ‘coming from’ in terms of their mental framework, very little substantive change can be achieved – in any domain. Going back to the ‘old soldier’ analogy, there was a sad story in a recent journal publication. It went...

Two Army officers, a colonel who had served two tours of duty in Vietnam and a captain who had served in Desert Storm, were engaged in a philosophical discussion concerning their experiences in armed conflict. Whereas the younger, very enthusiastic, officer spoke of the overwhelming victory in the desert, the older officer seemed to retreat into a mindset of ‘What if...?’ When the captain asked the seasoned colonel whether it really was the politicians who lost the war, the older soldier pondered for only a moment. He looked the captain in the eye and firmly stated that no, it wasn't all the politicians, it was as much culture as anything else. He then related his experiences.

*“I remember being a young second lieutenant with the 173d Airborne Brigade on Okinawa. We were alerted in late April, 1965, that we were going to Vietnam to defend our country. It never occurred to me to ask how Vietnam related to defending the United States. But that’s an issue for another day. We deployed in early May with the promise that by the 4<sup>th</sup> of July we would be parading in the streets of Naha, Okinawa, as returning victors. I guess we forgot to tell the Viet Cong. As a matter of fact, we knew very little about the Viet Cong in particular, or the Vietnamese in general. To be truthful, we really didn’t care about knowing the Vietnamese. To the best of my recollection, I never received any instruction about the way of life of these people living halfway around the world. We knew nothing of their beliefs, religion, attitudes, or behavior. Somewhere along the line I had heard that we were going about ‘winning the hearts and minds of the Vietnamese.’ That was a tall order for a culturally illiterate Army.”*

While they tried to carry out their duties honorably, the American soldiers simply did not understand the culture of the land in which he fought. So it is with interdisciplinary culture – the roadblocks to mathematical reform.

**Interdisciplinary Culture: the Roadblocks:** For the purpose of describing those roadblocks to reaching our collective vision, some literary license must be taken. Using the Vietnam experience as a backdrop, the definition of ‘Interdisciplinary Culture’ to be used is:

**Interdisciplinary Culture: The attitudes, habits, norms, activities, and values of a group of people from one academic discipline in relation to those of a differing discipline.**

Before discussing some interesting interdisciplinary culture roadblocks, we need to remember that the Project Intermath consortium has achieved:

- Putting tools (ILAPs) in place
- Dissemination of products/ideas to significant populations
- Used the ILAP in conjunction with national mathematics contests
- ‘Full-steam ahead’ attitudes among some institutions

Still, we need to acknowledge that the cultural impediments to our success are significant. Representative of those impediments (and there certainly are others) are the following: attitudes, habits, the state of ‘convenience’, and a national culture of ‘overload.’ Before going on, however, it needs to be stated that these cultural roadblocks are not the obvious, insidious, systems of ‘anti-social’ behavior. They are simple, seemingly benign, structures in our lives which impede our progress.

**Attitudes:** We cannot escape the fact that each of us perceives the world differently and, thus, carry unique judgements about disciplinary importance. There still exist (probably in large numbers) those mathematicians who view mathematics as that beautiful language which is ‘an end in itself.’ At the opposite end of the spectrum are those who view mathematics strictly as a bottleneck through which students must pass on the way to ‘disciplinary truth.’ The argument made often by engineers is that they (the engineers – of which the author is a subset of one) should teach their own math courses. Even the Accreditation Board for Engineering and Technology (ABET), under its new criteria for accreditation of engineering programs, does not preclude engineering-taught mathematics courses. Many proponents of other disciplines hold a similar perspective. The position of this paper is that mathematics, using communication, cooperation, and coordination, is best taught by mathematics professors. Along the way, however, the mathematics professor cannot teach an engineering related mathematics course without at least a ‘feel’ for the needs of the engineering community. It is no different for the geographer, the economist, or the social scientist.

**Habits:** Habits, bolstered by attitude, can be very difficult to break. To quote Joshua Chamberlain, the famous Civil War hero of the Battle of Little Round Top:

*“No man suddenly becomes different from his cherished habit and thought.”*

For all its flaws, the American undergraduate educational system is still perceived as the World’s best. If so, why should we change? We’ve done it that way for years and – so far – it works. Although inroads are being made, the habit of ‘separate disciplines need to remain separate’ still pervades American education. Two questions (hopefully viewed by the Intermath consortium as challenges) are offered:

- Is our educational system really the best?
- Under any circumstance, can we be better – much better?

If there is anything out there which provides the potential to break old habits, it is Project Intermath and its associated ILAPs.

**Convenience:** At first glance, ‘convenience’ doesn’t seem to fit this subject. It does. Breaking old habits, changing deep-rooted attitudes, and initiating new ideas all require visionary thinking, brainstorming, planning, coordination, developing resources, ‘selling the product,’ analysis of feedback and a large serving of determination. Culturally speaking, we have generally lived a creed which doesn’t expound ‘involvement with others.’ It is much easier to make small, fine-tuned, adjustments to the status quo and ‘Eureka’ – we have what is labeled as a new paradigm. A little ‘tweak’ here is far more convenient than a massive ‘twist’ there. Quite honestly, it’s hard to disagree with already hard-working academicians who believe that ‘. . . our pasture is green enough.’ The common statement heard is that ‘. . . it’s not worth the effort to see if the grass is greener on the other side of the fence.’ That Project Intermath has enjoyed some success can be credited in no small way to people leaving their own comfort level and being willing to break new ground.

**Overload:** Our American society has a culture today which mandates that we literally be ‘gerbils in a cage.’ We run harder and harder, and the wheel spins faster and faster. Yet, too many of us are going nowhere. Why? Because in the hurried life which we have created, very few of us have the time to ponder the now and envision the future. Let me offer an example. Of some 45 invited papers to the Project Intermath Workshop, 30 were submitted late, including mine and session organizer’s. Are we lazy? Are we procrastinators? Not really. It seems that by having so much going on in our lives, we continually move pots and pans between ‘front’ and ‘back’ burners. Of course, every day we add new burners – and multiple pots and pans are added to each new burner. This author began writing this paper while waiting to have his car serviced. Ironically, he thoroughly enjoyed the void of distractions. It’s not a case of ‘poor me’ or, better, yet, ‘poor us’ – it’s simply the way society has modeled our lives for us. Folks, we need to break out of the mold.

**Prognosis for the Future:** To this point it appears that the National Science Foundation is pleased with our product. Our thrust for the immediate future needs to include:

- Keeping the initiative alive
- Extending funding beyond the current funding cycle
- Continuing to foster communication at all levels.

The key truth about Project Intermath is that, if successful, it will prove to be far more than a new catalyst for mathematical reform. It is an educational product that can be modeled over time and again – developed for different segments of society and carried out in different venues. Success in Project Intermath provides for:

- Better mathematical instruction in support of other disciplines, leading to –
- Better educated students, able to –
- Better serve our society, leading to –
- Improved quality of life for all Americans, making possible –
- Improved quality of life well beyond our boundaries, resulting in –
- Possibilities left to the imagination of each participant of Project Intermath

As for exactly how we move through these roadblocks, I have some great ideas. I just wish I had the time to articulate them to you. But, as for our immediate future, I will offer that we have to continue our work. To paraphrase Jimmy Valvano – better known as ‘Jimmy V’ – “don’t give up, don’t give up, don’t ever, ever, ever, give up!”

### **References:**

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