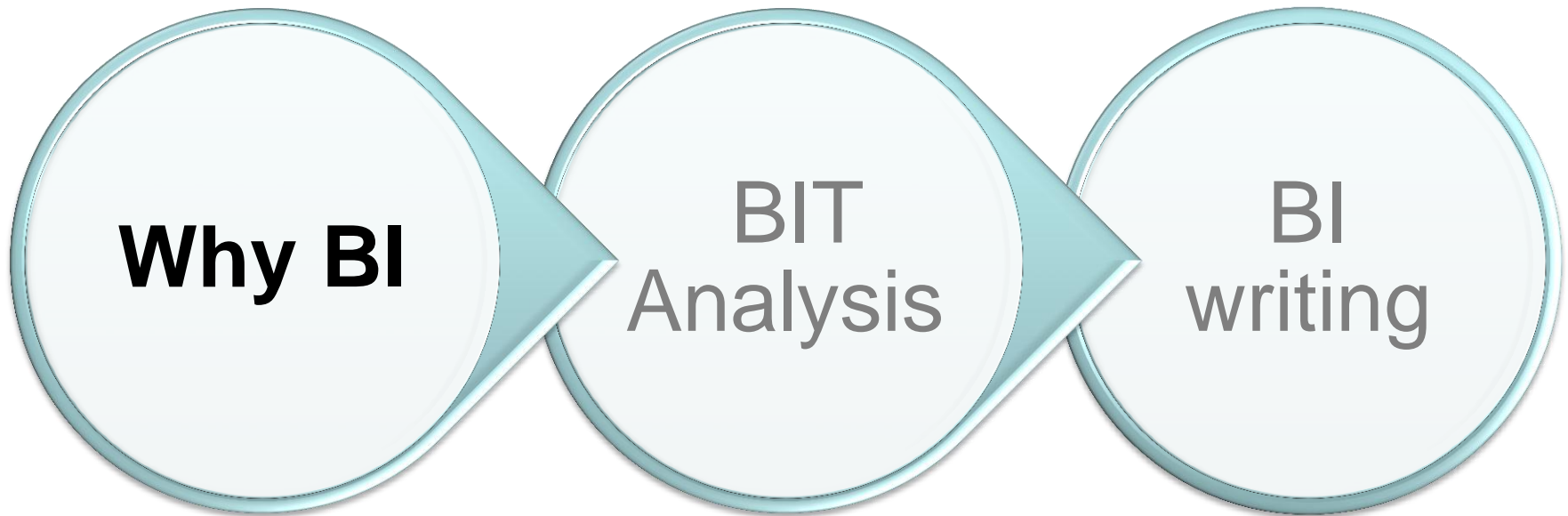


# Broader Impacts Text Analysis

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## Why BI

- NSF, proposal writers, **SP@ISU**

## BIT Analysis

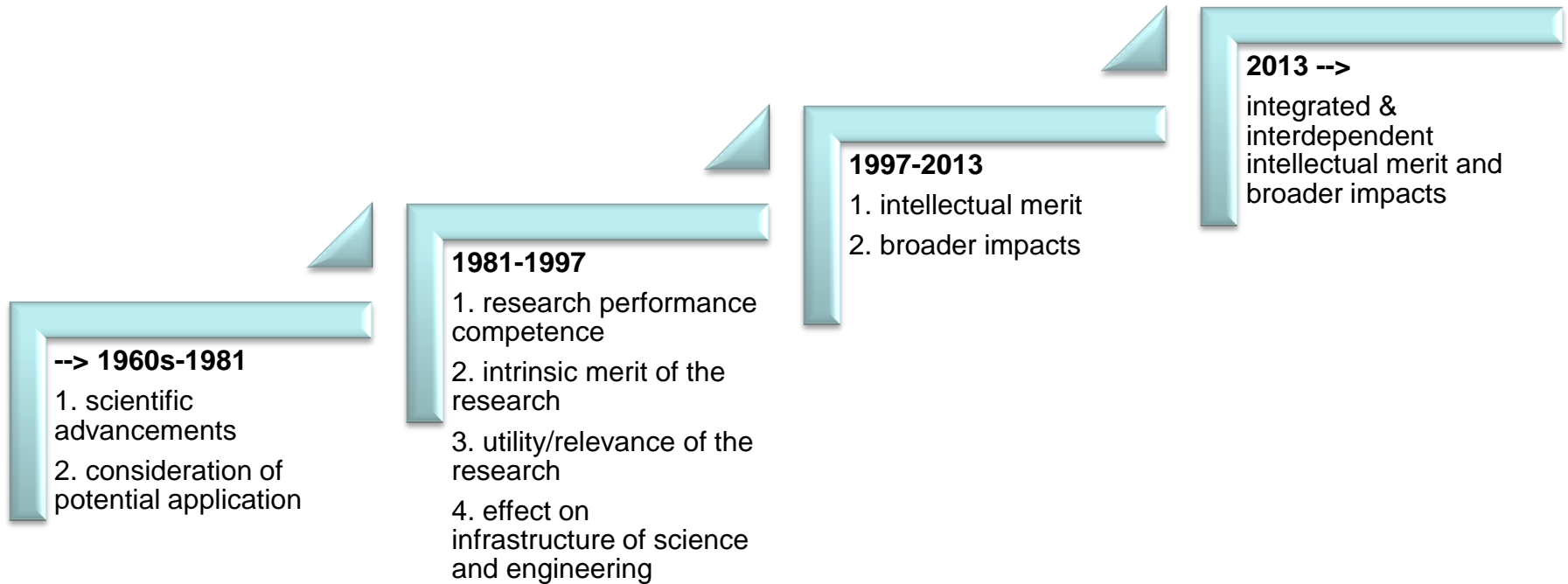
- Discourse conventions
- Funded vs unfunded proposals

## BI writing

- Effective writing

# “NSF makes every effort to conduct a fair, competitive, transparent merit review process”

(NSF Grant Proposal Guide, 2013, p. III-1)



# NSF Merit Review Criteria

Significant changes in the new Proposal and Award Policies and Procedures Guide (PAPPG) effective January 14, 2013

- 3 review principles: advanced knowledge, broad societal impact, evaluation
- 2 review criteria:
  - Intellectual Merit (IM) – advancements of knowledge
  - Broader Impacts (BI) – benefits to society
- 5 review elements: IM and BI potential, transformative potential, success assessment mechanism, qualification, resources

# Implications for proposers

- Conduct and assess BI activities, esp. not intrinsic to the proposed research
- Implement BI activities with organizational support
- Describe BI in separate sections of the Project Summary and Project Description

## But

- Community-wide understanding of BI has been weaker than of IM
- Persistent anecdotal reports about confusion related to the broader impacts
- There is a fair amount of interpretation of BI left open to grant writers, reviewers, and program officers

(NSF, 2010, 2012)

How to write effective Broader Impacts plans?



***SP@ISU*** creates an additional opportunity  
to learn more about Broader Impacts writing

→ **BIT Analysis Project**

Think of specific examples of BI activities that you are currently considering.

How would you present them in your proposal?

**Let's write!**

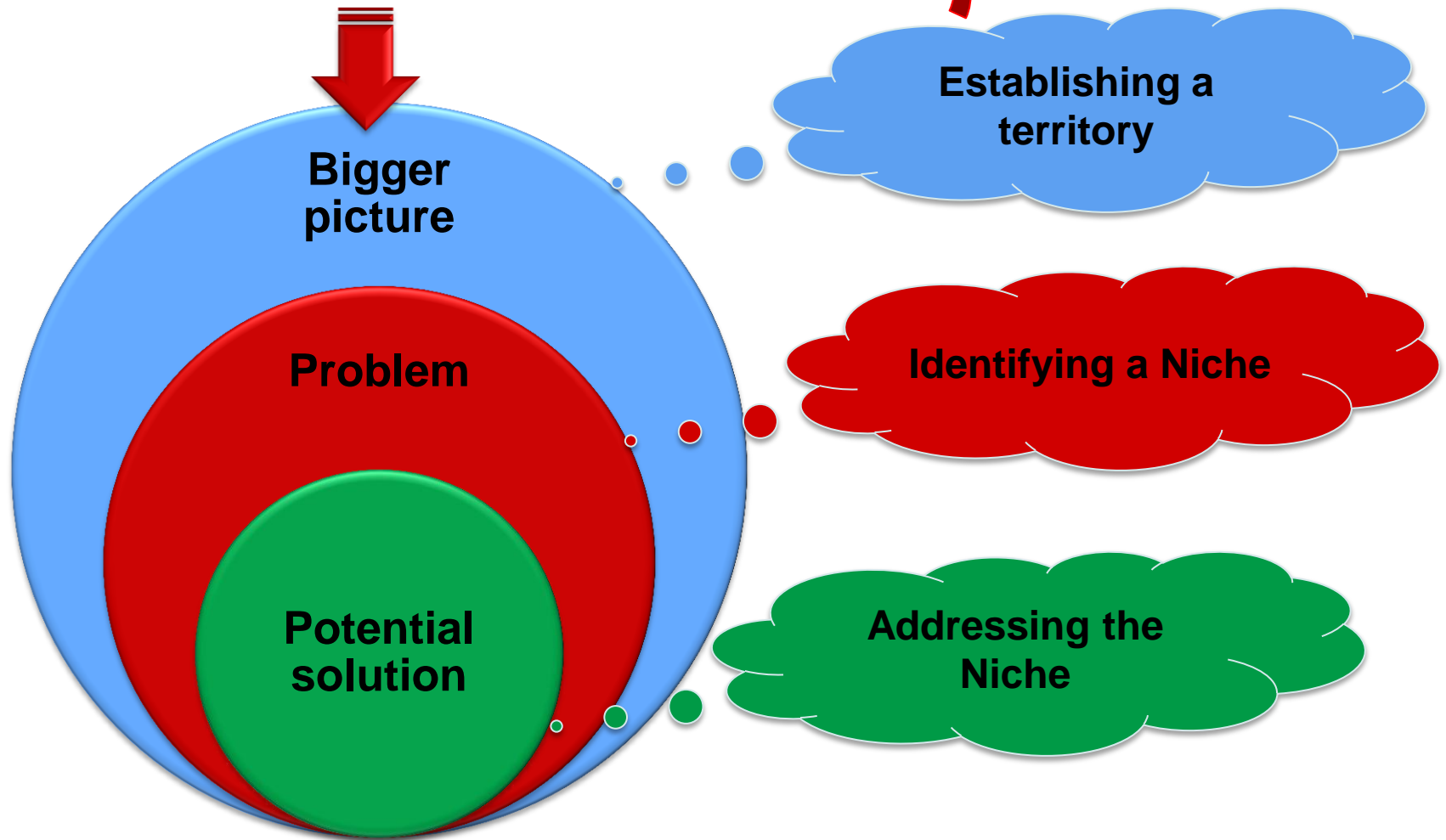
Let's stop and think about communication  
– what do we do when we write  
about research?



## INTRODUCTION (Research Article in Agricultural and Bio-Systems Engineering)

Sampling frequencies in regional and national water quality networks are often set to be time proportional (e.g., from bimonthly to bimestrial) and generally uniform across all monitoring stations (e.g., monthly sampling in the implementation of the Water Framework Directive in Europe; EU, 2000). The advantages of using uniform frequencies include, among others, a set schedule for field service and ease of budget allocation. However, it seems quite intuitive that the variability in size and hydrological regime among watersheds of the same network would call for an adjustment of the sampling frequency on a per watershed basis. Indeed, uncertainties of water quality indicators (e.g., loads, average, median concentrations, etc.) induced by infrequent sampling have been shown to vary considerably between watersheds of variable sizes and hydrological years (e.g., Wang et al., 2003; Moatar et al., 2006; Moatar and Meybeck, 2005, 2007; Johnes, 2007, Moatar et al., 2009; Birgand et al., 2010). The consequences are potential ill comparisons, between watersheds and between years, of water quality indicator values for which the uncertainties may differ by several fold (e.g., Birgand et al., 2010). Harmonizing uncertainties to a standard level for indicators is key to improving the quality of reported values and to deriving meaningful conclusions about the state and trends in water quality in regional and national monitoring networks. This essentially implies adjusting sampling frequencies on a station by station basis. Until now, however, to our knowledge there has been no detailed report linking the uncertainty level, the sampling frequency, and the watershed characteristics, and proposing sampling frequency recommendations on a case by case basis. Moatar and Meybeck (2007) and Moatar et al. (2009) have shown that the hydrological regime of watersheds could be used to predict uncertainty levels for pollutants usually linked to particles. This work aims to expand on this approach and derive sampling frequency guidelines as a function of the hydrological reactivity and a desired uncertainty level to annual nitrate fluxes and concentration indicators in Brittany, France.

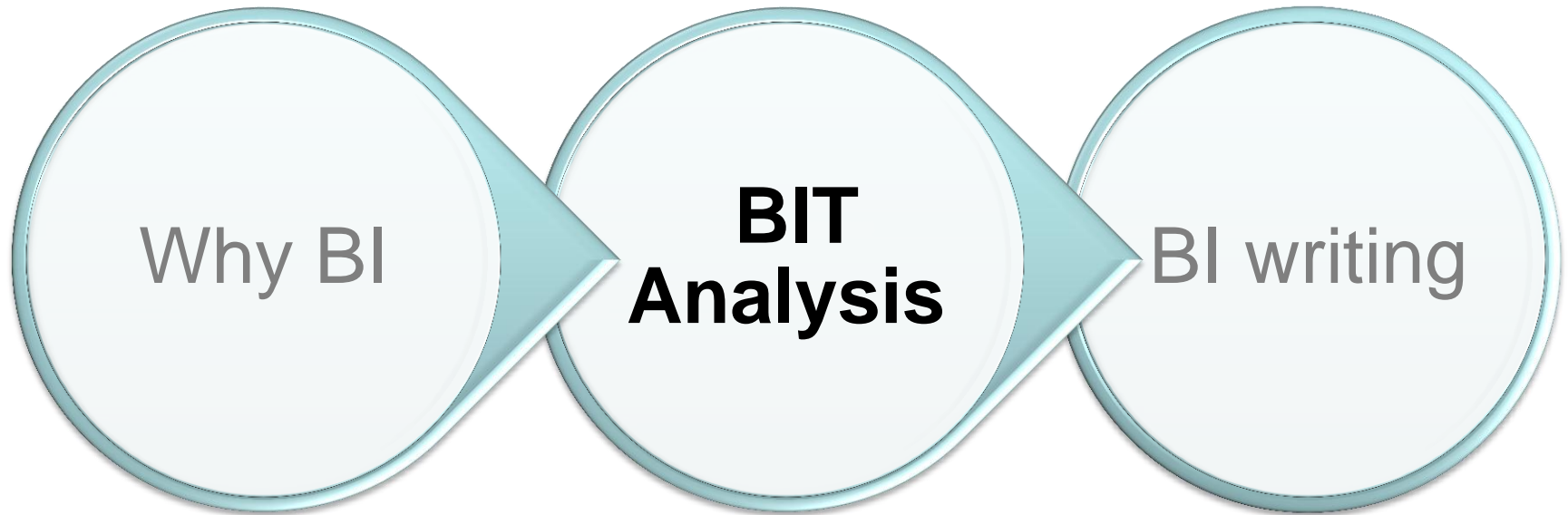
# Communicative goals



# How does this apply to BI writing?

## Broader Impacts sections also

- Present a high-impact argument
- Fulfill communicative goals to build the argument
- Employ different strategies to achieve communicative goals



- NSF, proposal writers, **SP@ISU**

- Discourse conventions
- Funded vs unfunded proposals

- Effective writing

# How is a BI argument crafted?

- What are the writing conventions characteristic of BI discourse?
- How are they used in grant proposals (funded and unfunded)?

# BIT Analysis

## BI Corpus

- Corpus of 80 GPs
- Separate BIs sections
- 2005 & 2012
- 36 funded & 39 not funded, 5 unknown
- Different fields



## BI conventions

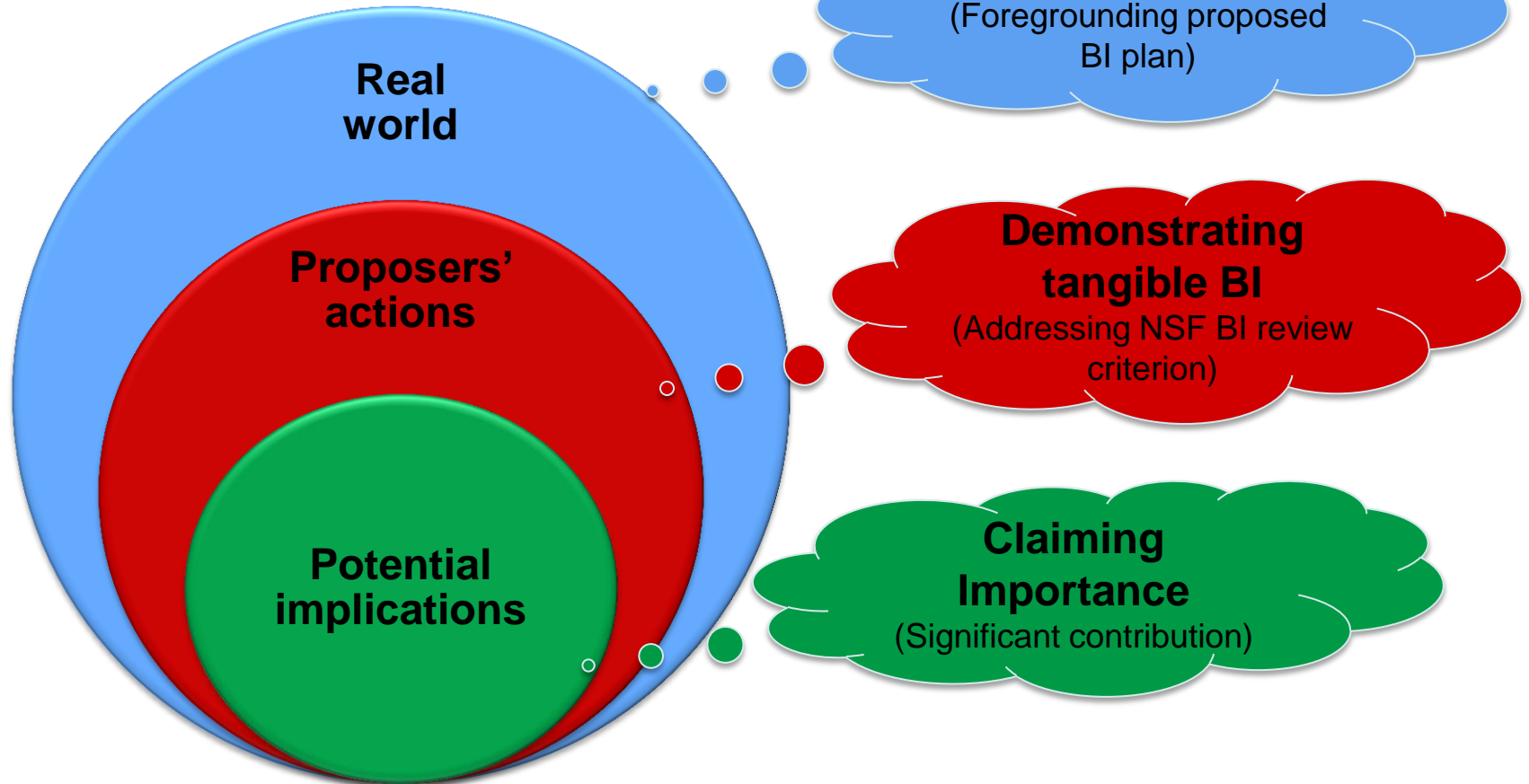
- Identification of discourse conventions
- Developed analytical framework
- Concurrent segmentation & classification of BI corpus
- Quantitative & qualitative analysis of annotated texts

# BIT Analysis

BI arguments in funded and non-funded proposals exhibit:

- Similar use of discourse conventions
- Qualitative differences

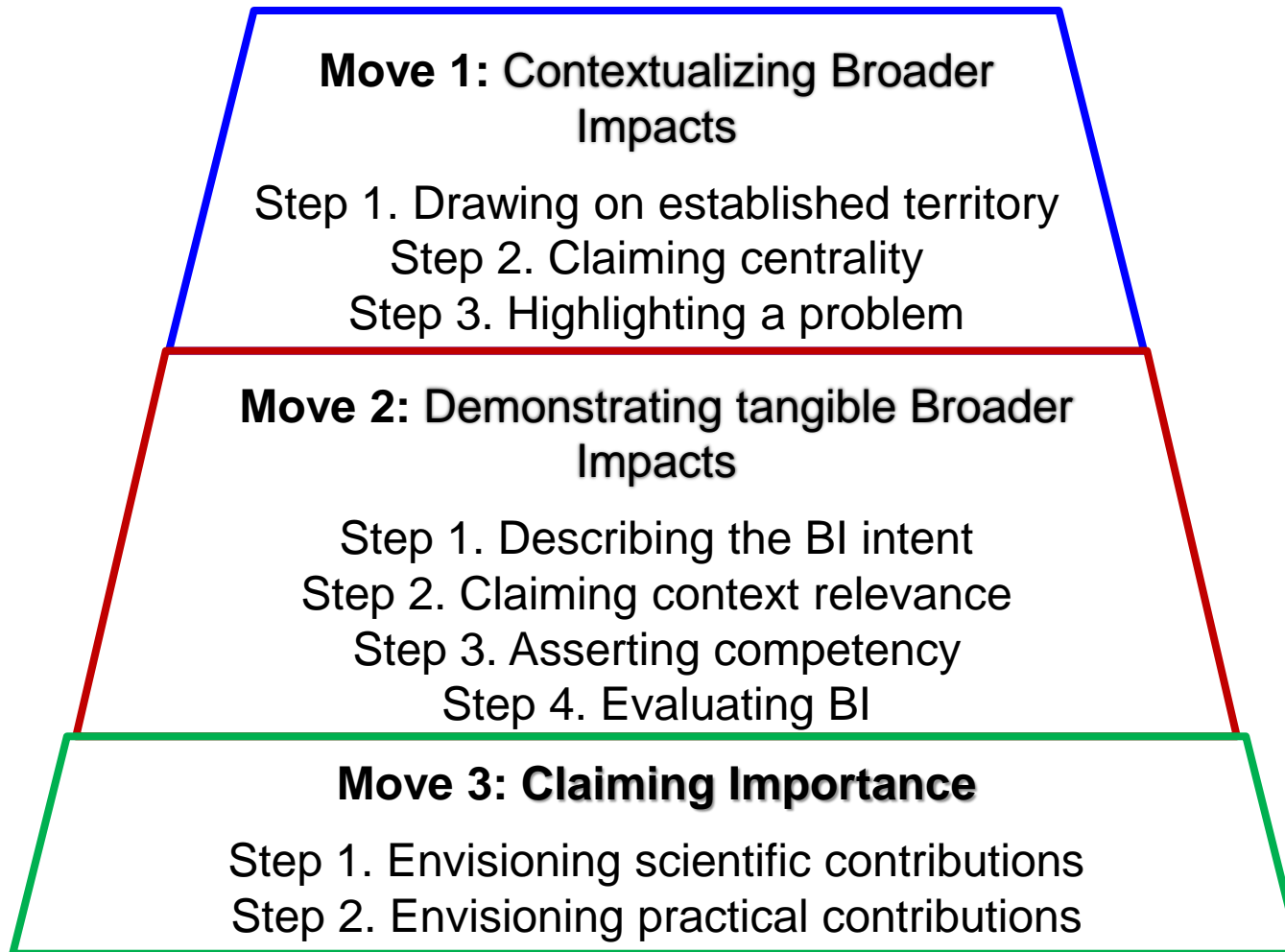
# Communicative goals





# Handout 1: Clarifying terminology

# BI communicative framework



# Handout 2: Communicative framework for Broader Impacts

# Communicative functions & content realizations

## Move 1: Contextualizing BIs

### Step 1. Drawing on an established territory

- 1a: Drawing on real-world context
- 1b: Drawing on a targeted context
- 1c: Drawing on previous research
- 1d: Drawing on current proposal

### Step 2. Claiming centrality

### Step 3. Highlighting a problem

### Step 1b. Drawing on a targeted context

**Function:** to situate the proposed project and/or BI activities in a specific, local context

**Content:**

- current activities of the PIs
- current activities of the targeted project participants
- structure, functionality, composition, role, etc. of participating units
- existing resources and facilities
- ongoing projects/activities/practices

# Communicative functions & content realizations

## Move 2: Demonstrating tangible BIs

### Step 1. Describing BI intent\*

Teaching, training, & learning  
Participation of underrepresented groups

Infrastructure for research & education

Dissemination

Benefits to individuals/groups

### Step 2. Claiming context relevance

### Step 3. Asserting competency

### Step 4. Evaluating BI

### Step 1. Describing BI intent

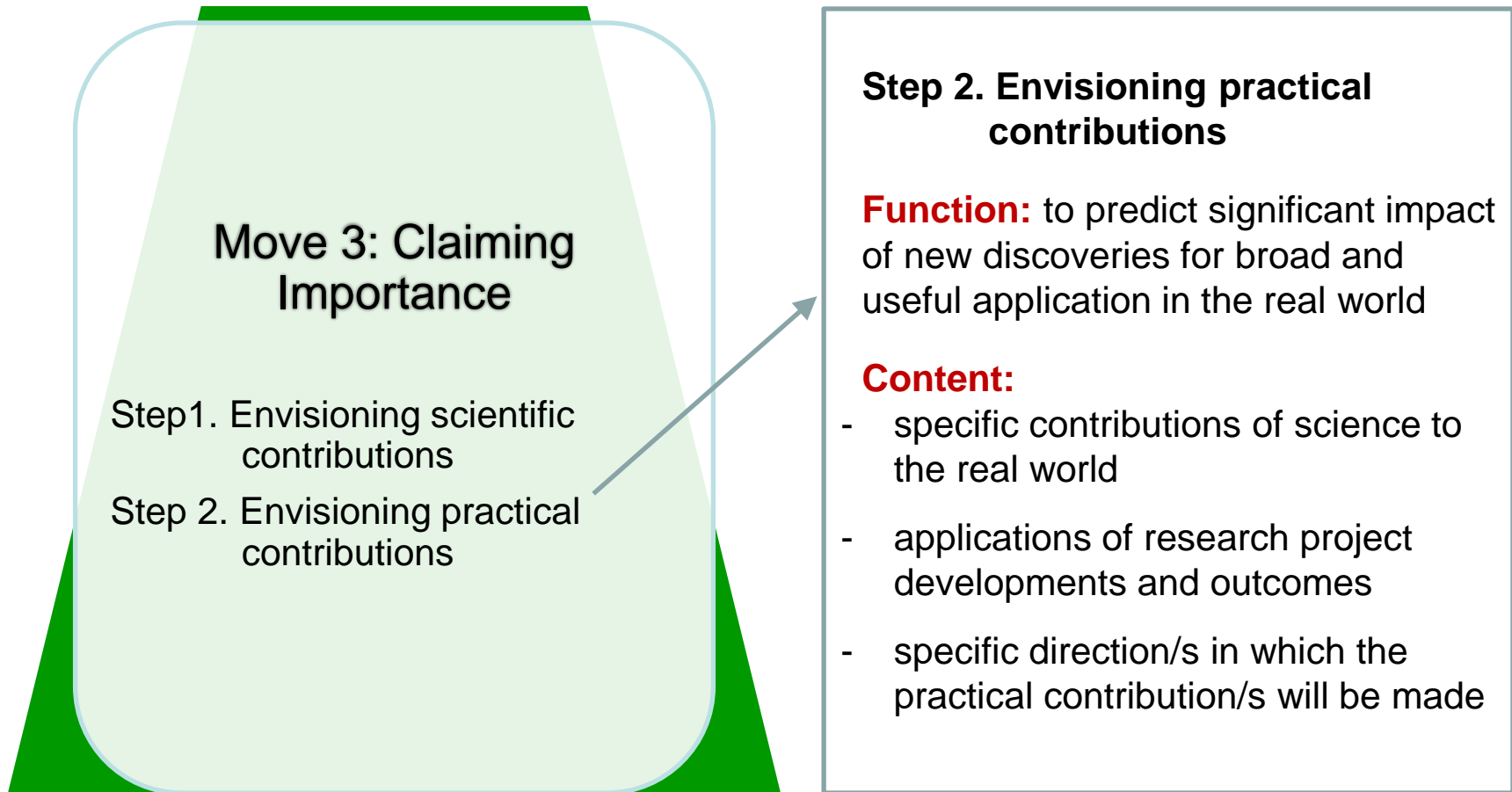
**Function:** to demonstrate the impacts of the proposed BI activity in the targeted context

**Content:**

- statements of BI intent and/or purpose
- details about proposed BI activities
- specific means that will be employed to accomplish the BI intent
- specific deliverables

\*NSF added: Increased partnerships between academia, industry, etc.; improved national security; & increased economic competitiveness of the U.S.

# Communicative functions & content realizations



## Broader Impacts

Disaster-related issues severely affecting locally owned businesses in small, rural communities have been under-investigated in disaster research (source, 2007). *[highlighting a problem; drawing on previous research]* Understanding these issues is of critical importance to the entire disaster-preparedness community as well as to disaster recovery organizations. *[claiming centrality]* To help educate rural retail and service businesses about mitigating effects of future disasters, we will focus on examining community level factors that impact small business behaviors, attitudes, and motivations prior to, during, and following a disaster event. *[drawing on current proposal]*

Our research results will be used to develop diagnostic tools and a toolkit of recovery strategies, which we will make available to community planners, small business owners, extension scientists and business consultants via the [...] website and other public media. We will also introduce the new tools and strategies to higher education institutions. *[describing BI intent]* For that, we will deliver workshops for [...] students, which will take place in our new state-of-the-art research classroom. *[claiming context relevance]* This will contribute to better preparing a new generation of disaster recovery specialists. *[describing BI intent]*

As in our previous NSF-funded work, our research and outreach activities will be continuously evaluated through analyses of multifaceted data sources. *[evaluating BI]* Our research team is well qualified to implement and evaluate the proposed work. PI [...] has 20 years of practical experience with the state of [...] for [...] emergencies, disaster preparation and response. Drs. [...], [...], and [...]’s collective expertise in [...] and [...] has evolved from a [...] grant, which brought rural researchers together to focus on identifying high-stakes priorities. *[asserting competency]*

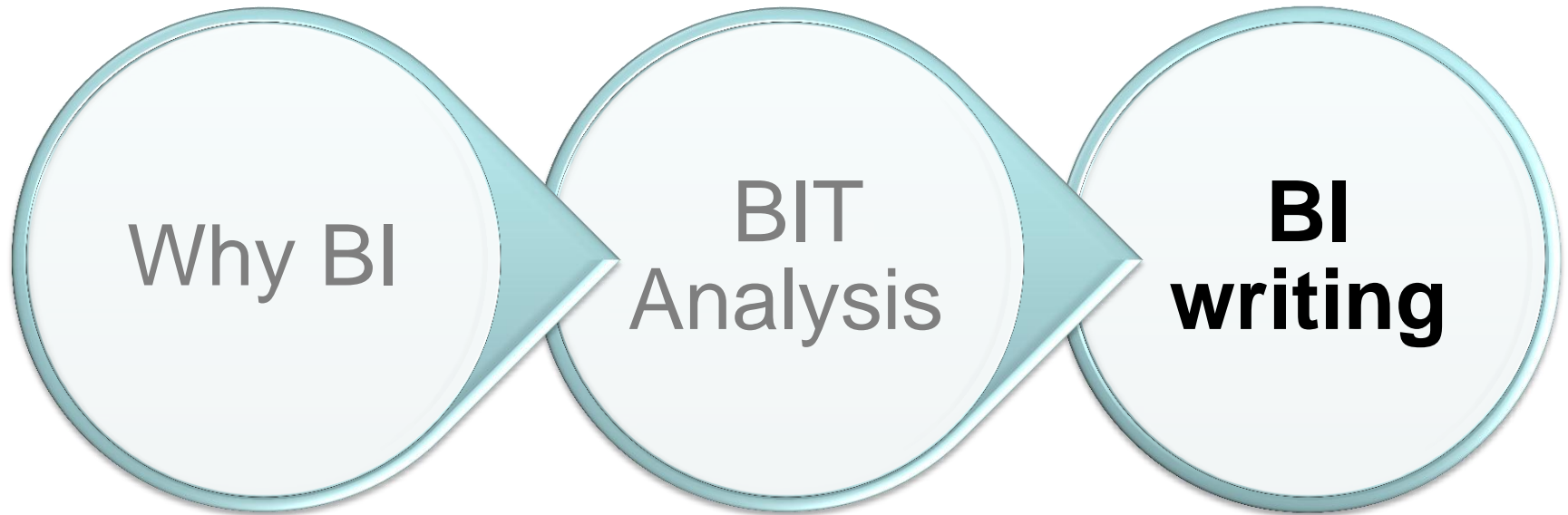
The outcomes of the proposed project will advance rural disaster research by providing a needed framework for understanding the role of [...] in disaster outcomes. *[envisioning scientific contribution]* Increasing understanding of post-disaster outcomes for local businesses can lead to solutions that will strengthen rural communities and will preserve them as attractive places to live and work. *[envisioning practical contribution]*

Which moves (communicative goals)  
did you address when drafting  
your broader impacts activities?

Which steps (writing strategies)  
did you use and  
which would you additionally employ?

Will your reader interpret your  
communicative intent the same way?





- NSF, proposal writers, **SP@ISU**

- Discourse conventions
- Funded vs unfunded proposals

- Effective writing



Audience,  
Please believe  
Me, I wouldn't  
lie to you...

Persuade NSF reviewers not only by what is said, but also by **how it is said**

# What is conveyed?

“The [...] devices are fully portable and can be transported along with a computer to a school for demonstration.”



Could be interpreted as providing general information perhaps needed to contextualize envisioned broader impacts

→ We will use the [...] devices to demonstrate natural interactions with [...] models to students in their schools.

Announces BI intent, clarifies means, specifies individuals and targeted territory

# What is conveyed?

Discussions are underway for graduate exchange between ISU and several universities in [countries].



Could be interpreted as general reference to the targeted context perhaps needed to contextualize envisioned broader impacts

→ The PIs are leading discussions about graduate student exchanges between ISU and several universities in [countries].

Asserts PIs' competency by specifying initiated activity and targeted contexts, which is indicative of potential success of BI intent

## Handout 3: Examples

What are these sentences doing?  
How do you know?

# Communicative functions & linguistic realizations

## Move 1: Contextualizing BIs

### Step 1. Drawing on an established territory

- 1a: Drawing on real-world context
- 1b: Drawing on a targeted context
- 1c: Drawing on previous research
- 1d: Drawing on current proposal

### Step 2. Claiming centrality

### Step 3. Highlighting a problem

#### Step 1a. Drawing on real-world context

[...] is primarily captured as a by-product of the processing of [...] deposits found in the western [...]. (GP77)

#### Step 2. Claiming centrality

With the potential retirement of nearly 50% of the [...] workforce in the next 10 years [48], such plans for broadening participation in [...] are critical for our national and economic security. (GP83)

#### Step 3. Highlighting a problem

Increasing [...] prices to this extent will cause immeasurable harm to the nation's economic vitality. (GP31)

# Communicative functions & linguistic realizations

## Move 1: Contextualizing BIs

### Step 1. Drawing on an established territory

General, neutral language; specialized vocabulary; present and past tenses

*(are found in, is emitted through, is widely used in, is primarily captured as, are comprised of multiple, costs less than, reserves of [product] are about [quantity], soared above [amount] in world markets, was established in [year])*

### Step 2. Claiming centrality

Persuasive language; present and present perfect tenses

*(there has been a spate of interest in, have become increasingly interested in, has generated interest in, raises questions of considerable interest for the understanding of, has become an important aspect of, is of the utmost importance, is critical for, is a classic problem, has been studied by many, has contributed to the widespread adoption of, is the essential component of, is a potentially significant technology)*

### Step 3. Highlighting a problem

Negative connotation language; present and present perfect tenses, modal verbs

*(however, significant challenge, increasing pressure, adverse impact, scarce, lacking, received little attention, rarely reported, poorly known, only a few experiments exist, contradicting findings, inconclusive results, policies are controversial, represents a significant concern, could cause substantial harm, attempts have failed, causing a serious shortage, do not perform well)*

# Communicative functions & linguistic realizations

## Move 2: Demonstrating tangible BIs

### Step 1. Describing BI intent

Teaching, training, & learning  
Participation of underrepresented groups

Infrastructure for research & education

Dissemination

Benefits to individuals/groups

### Step 2. Claiming context relevance

### Step 3. Asserting competency

### Step 4. Evaluating BI

### Step 1. Describing BI intent (participation of underrepresented groups)

Through active recruiting of minority and women graduate students from REU sites, partner institutions, and [...] and [...] programs at ISU, the [...] program will involve a diverse set of participants. (GP61)

### Step 2. Claiming context relevance

ISU's [...] Department has an excellent foundation on security research via the well-recognized [...] -designated [...] Center. (GP4)

### Step 3. Asserting competency

The research team is well positioned to transfer the knowledge and practical insights to [...] management agencies with whom they actively interact through several large-scale activities carried on in [...]. (GP79)

### Step 4. Evaluating BI effectiveness

On the website, we will collect information on [...] and deliver follow-on questionnaires to those using the materials to obtain more details of the program impact. (GP78)



# Communicative functions & linguistic realizations

## Move 2: Demonstrating tangible BIs

### Step 1b. Describing BI intent

Effect language; BI-specific vocabulary; action verbs; future tense

*(incorporate, comprise, develop, deliver, integrate, recruit, provide experience, mentor, engage, complete, involved in, performed by, serve as, establish a repository, create/share a database, make freely available, publish, disseminate, submit, post, present; enhanced, unique, beneficial)*

*Mini-module design groups: Each student and postdoc researcher will work 2 weeks/year with the Meta!Blast team developing an aspect of a new Meta!Blast mini-modules and will demonstrate Meta!Blast to student groups, schools, or the public. Each design group will include both TU and ISU researchers. These mini-modules could promote public awareness on issues such as sustainability, protein deficiency, GMOs, or could be a statistics or bioinformatics computer game. We anticipate six well-designed mini-modules over the course of the proposed research. (shared by Eve Syrkin Wurtele)*

# Communicative functions & linguistic realizations

## Move 2: Demonstrating tangible BIs

### Step 1b. Describing BI intent

Effect language; BI-specific vocabulary; action verbs; future tense

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### Step 2. Claiming context relevance

Persuasive language; present and present perfect tenses

*(has a strong program, extremely competitive, provides a first-hand experience, includes extensive training, has realized significant results in, has seen a dramatic increase in, state-of-the-art technology, has already developed, parallel goals, as demonstrated by, serves a high proportion of, has been in place for # years, home to one of the highest enrollments of, reaches potentially # students)*

### Step 3. Asserting competency

Persuasive language; present and present perfect tenses

*(has a long track record, collaborated extensively with, prior success with, recognized by an award, several decades of experience in, has served as, highly successful in obtaining extramural grants, previously implemented via, active in publishing research results in highly regarded journals, our collaborative research group brings together experts from, is an active member of)*

### Step 4. Evaluating BI

Evaluation language; future tense

*(beta-test, test the outcomes of, assess via, collaborate with, in evaluating, collect feedback, determine, analyze evaluation results, validate findings, evaluate performance by, obtain information directly from, conduct follow-on data collection and analysis)*

# Communicative functions & linguistic realizations

## Move 3: Claiming Importance

- Step 1. Envisioning scientific contributions
- Step 2. Envisioning practical contributions

### Step 1. Envisioning scientific contributions

The research on [...] provides a prime example of the significant impact that the sequencing of the [...] and associated [...] resources has made on the science of [...] and on use of [...] as a model organism. (GP36)

### Step 2. Envisioning practical contributions

The long term benefit of the proposed study is to provide an economical solution to [...] nationwide in addressing their future [...] issues. (GP57)

Ultimately, technological innovations of this sort will be required for our nation to achieve independence from foreign [...] reserves. (GP40)

# Communicative functions & linguistic realizations

## Move 3: Claiming importance

### Step 1. Envisioning scientific contributions

Effect and persuasive language; future tense; modal verbs

*(enhance, foster, provide a novel framework, significantly advance the field of, increase fundamental knowledge, provide a quantum leap in our understanding of, bring to the science community a new perspective, offer direct insight into, advance research capabilities of, improve our ability to conduct, induce more aggressive work in the area of, may synergize with research geared toward, foundation for, facilitate understanding, invaluable insights, important advance)*

### Step 2. Envisioning practical contributions

Effect and persuasive language; future tense; modal verbs

*(be of value to, have a positive impact on, allow for the development of, broadly applicable, may facilitate the use of, may in the long term allow for, help make future decisions, be of interest to policy makers and governments, has the potential to greatly reduce costs, have an appropriate model to follow, can inform practitioners/community groups who deal with, help businesses/governmental agencies/nongovernmental organizations deal with, create measurable benefits for industry and the American public, could lead to the development of new, will raise the public awareness of, significantly change the way, provide procedures for government agencies, can lead to better estimates, provide an integrated perspective on [...] that will extend outside the realm of [...] research and into the community of decision makers)*

Appropriate language choices are key to being  
explicit and  
communicatively effective.

Maximize the presentation of the argument by  
using language that best moves reviewers and  
program officers to understanding,  
remembering, and convincing.



Unfunded proposals employ similar discourse conventions but exhibit more distinct 'syndromes':

- Content
- Communication
- Language use
- Writing quality



# Content syndromes

- *'trust me'*

lack of specificity; vague and devoid of details on how BI activities will be carried out; may announce intent but fail to elaborate, clarify means, specify deliverables; undeveloped information

- *'shopping list'*

listing all possible BI activities, often at the level of mention and completely disconnected

- *'field of dreams'*

assumption that doing something will be used/useful just by virtue of its being great; i.e. fail to demonstrate a process by which target audiences will be engaged and lack specific measures of success

- *'imbalance'*

unbalanced development of ideas; too much information about something at the expense of more important BI aspects

- *'false light'*

only implicit focus on the BI activity but the explicit focus is on something else

# Communication syndromes

- *'no story'*

not telling a 'story'; no beginning and/or end; not contextualizing; not looking into the future

- *'fail to convince'*

weak argumentation; either claims have no warrant or warrants appear without a claim to support

- *'wander the maze'*

lack of clarity of intended meaning; vague ideas; ambiguity

- *'read my mind'*

assuming that readers know what the writer means and can read between the lines



# Language use syndromes

- *'can't enthuse'*  
plain language choices; ideas not communicated clearly
- *'living in the past'*  
using past and present to show what has been done implying that it, in fact, will continue to be done
- *'passive talk'*  
passive voice instead of action verbs to explicitly state BI activity implementation intent
- *'super ward off'*  
using overly strong hedges or completely negative statements about abilities, plans, and potential results to acknowledge limitations and prevent criticism
- *'insensitive reference'*  
inappropriate language use referring to underrepresented minority groups

# Writing quality syndromes

- *section-level*

lack of clarity and logical flow, disconnected ideas, confusing headings, poor transitions, ineffective signposting, recycled/cut-and-paste content from one section or paragraph to another

- *paragraph-level*

misleading topic sentences, no link between sentences, misleading beginning, no closure to a paragraph, new information dropped into the very end of the paragraph, recycling information from one paragraph to the next creating redundancy

- *sentence-level*

overly long and complicated sentences, grammar and expression errors, misspelling, punctuation

# BI writing highlights

## NSF about well-written BIs → Communicative framework

- Include activities that are clearly described → *M2, S1 Describing BI intent (elaborate, clarify means, specify deliverables)*
- Have a well-justified rationale → *M1, S2 Claim centrality & S3 Highlight a problem; M2 S2 Claim context relevance*
- Demonstrate creativity or originality, or have a basis in established approaches. → *M1, S1 Draw on established territory*
- Contain a well-organized strategy for accomplishment of clearly stated goals → *M2, S1 Describing BI intent & S4 Evaluate BI effectiveness*
- Establish the qualifications of those responsible for the activities → *M2 S3 Assert competency*
- Demonstrate sufficient resources for support → *M2 S2 Claim context relevance*
- Have a plan to document the results → *M2 S4 Evaluate BI*
- Emphasize the value of broader impacts of scientific research and societally relevant outcomes → *M3 S1,S2 Envisioning scientific & practical contributions*

# BI writing highlights

The communicative framework can  
be used as a guide  
to crafting the BI argument

# BI writing highlights

- Content is ‘quilted’ with the help of different strategic steps to achieve communicative goals
- The step functions are more effectively realized with appropriate linguistic choices
- Careful revision/editing and avoiding ‘pitfall syndromes’ are a must

## Special thanks

**SP@ISU** Diane T. Rover, Bonnie S. Bowen, Megan Heitmann

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