Agricultural Innovation Program (AIP) for Pakistan

Scientific Writing Workshop

Workshop Handout

NARC, Islamabad

August 26-27, 2015

Mark Bell and Tom Rost

Support by Ayesha Arif <aarif@ucdavis.edu>

Major reference. The work draws heavily on the excellent article by Emily Wortman-Wunder and Kate Kiefer. (1994 - 2012). Writing the Scientific Paper. Writing@CSU. Colorado State University. Available at http://writing.colostate.edu/guides/guide.cfm?guideid=83.

Agenda for the Scientific Writing Workshop 26-27 August, 2015

After going through this learning module, the participants will

- know the primary sections included in a standard scientific paper
- understand the primary content and purpose of each section, and
- have drafted (selected sections of) a Scientific paper.

Workshop flow:

1. Introductions and expectation
2. Review the sections and order of elements in a Scientific paper.
3. Describe the elements included in each section of a scientific paper; and
4. Summarize, practice and review the activities and key points in writing a scientific paper
5. Wrap-up (and evaluation)

Daily schedule

Note - this **schedule** is meant to be a **guide only**. The actual agenda progress will depend on participant interests and activity and discussion progress.

Day 1.

9.00 Recitation
9.05 Workshop Introduction and guidelines

Participant introductions and expectations
- Review the sections and order of elements in a scientific paper;
- Describe the elements included in each section of a scientific paper; and
- Summarize, practice and review the activities and key points in writing a scientific paper.

11.00-11.30 Morning tea
11.30 - continue
1.30-2.30 Lunch
2.30 - Presentation by USAID and CIMMYT
Continue plan development
3-3.30 afternoon tea
3.30 - continue plan development and recap
4. Finish for the day.

Day 2.
9. Recitation
9.05 Recap Day 1 revisit objectives and expectations
Scientific writing discussions
11.00-11.30 Morning tea
11.30 - revisit output
1.30-2.30 lunch
2.30 - continue writing refinement
3-3.30 afternoon tea
3.30 - Wrap up and evaluation
4. Finish

Class Objectives. After going through this learning module, the participants will

1) know the primary sections included in a standard _____ paper
2) understand the primary content and _____ of each section, and
3) have _____ (selected sections of) a Scientific paper.

Key Concepts. Key points that should be remembered at the end of the class:

1. A scientific paper follows set structures (as defined by the _____ involved), and
2. Each section has a clear and separate _____.

Make a list of the common elements in a scientific paper (e.g., Title, plus….?

1. **Title**
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

What makes a good paper?

What makes good writing?

A note on good writing

What needed and common problems

Be simple _____ and _____

Avoid….

- unnecessary or fancy words and phrases
- Generalities (Not being specific).

"More". Good writing is about communicating well. Here are furthers ideas to consider:

1. Organization needs to be logical and effective.
2. Voice should be individual and appropriate.
3. Word Choice should be specific and memorable.
4. Sentence Fluency needs to be smooth and expressive.
5. Conventions must be correct and communicative.
6. Get rid of excess.

Rewrite the bad example in the space using the principles above.

Bad examples	Rewrite
We utilized the tractor which was owned by the farmer for ploughing the fields some 2 weeks prior to the planting of the wheat crop.	
The new technology which involves drip irrigation run by an imported diesel motor was beneficial to the stakeholders by improving their daily livelihoods.	

Defining the sections or elements

Common paper elements	Your definition
Title	The title indicates the subject and what aspect of the subject was studied
Abstract	
Introduction	
Materials and methods	
Results	
Discussion	
Conclusion	

Class definitions

Title

The subject and what aspect of the subject was studied.

Abstract

The summary of paper: The main _____ for the study, the primary _____, the main _____

Introduction

_____ the study was undertaken

Methods and Materials

_____ the study was undertaken

Results

_____ was found

Discussion

why these results could be _____ (what the reasons might be for the patterns found or not found)

Conclusion

Was the work _____ and/or recommended _____ steps.

Where do I start? How do you actually write a paper

Actual order depends on the author, but one option is:

(Draft Title)

1. **Authorship**
2. **Title**
3. **Results (analyze data)**
4. **Materials and methods**
5. **Introduction**
6. **Discussion and conclusion**
7. **Abstract**
8. **Revisit title**

1. Authorship Acknowledgment.

How decide who should be an author?

In addition to the main or senior author who performed the bulk of experimentation and writing of the paper, people who actually contributed substantially during the conduct of the study and preparation of the paper are listed as co-authors. The order in the by-line is based on the degree of contribution of each co-author.

What's the difference between authorship and acknowledgments?

1. Possible Authors:

2. Possible people to acknowledge:

2. Title.

Keypoint. In the title describe _____ is the subject and what _____ of the subject was studied.

Describe what is your subject and what aspect of the subject is studied.

Pick a topic you are familiar with and draft a title.

_____

3. Results (analyze data)

Keypoint. The Results describe _____ was found

This section presents

1) The _____ -- what was found in the course of this investigation,
2) Detailed data--_____, counts, percentages,
3) _____--usually appear in tables, figures, and graphs,
4) _____- drawing attention to the key data and relationships among data.

Three rules of thumb will help you with this section:

1) present _____ clearly and logically
2) avoid _____ writing
3) consider a one-sentence summary at the _____ of each paragraph, if you think it will help your reader understand your data

Activity. Make a brief list of the types of data collected (e.g., weather data, soil data, plant or animal observations, yields, incomes, ….) and how it might best be presented (text, table, figure or..)

Data collected	Presentation options (text, table, figure or..)

For your data set, what are the main findings?

4. Materials and Methods (Methodology).

Keypoint. Materials and Methods describe _____ the study was done

Activity. Indicate:

- Where the study occurred: _____

Make a list of the important activities and procedures – in the order they were implemented

Activity	Procedure	Modified from standard?	Will describe or Reference

Any assumptions underlying the study? _____

Statistical methods used (including software programs): _____

5. Introduction.

Keypoint. The Introduction describes _____ the study was done.

Question – What should you include in the Introduction?

1. Start with two or three sentences placing your study subject in _____.

- **Example.** "Echimyid rodents of the genus *Proechimys* (spiny rats) often are the most abundant and widespread lowland forest rodents throughout much of their range in the Neotropics (Eisenberg 1989). Recent studies suggested that these rodents play an important role in forest dynamics through their activities as seed predators and dispersers of seeds (Adler and Kestrell 1998; Asquith et al 1997; Forget 1991; Hoch and Adler 1997)." (Lambert and Adler, p. 70)

- **Your context (i.e., the circumstances surrounding your research) example**:

2. Follow with a description of the _____.and its history, including previous _____.

- **Example.** "Despite the ubiquity and abundance of *P. semispinosus*, only two previous studies have assessed habitat use, with both showing a generalized habitat use. [brief summary of these studies]." (Lambert and Adler, p. 70)

- **Your "problem and previous research" example**:

3. Describe how your work addresses a _____ in existing knowledge or ability (here's where you state why you've undertaken this study).

- **Examples.** "No attempt has been made to quantitatively describe microhabitat characteristics with which this species may be associated. Thus, specific structural features of secondary forests that may promote abundance of spiny rats remains unknown. Such information is essential to understand the role of spiny rats in Neotropical forests, particularly with regard to forest regeneration via interactions with seeds." (Lambert and Adler, p. 71)

- **Your "gap" example**:

4. State what information your article will _____.

- **Examples.** "We present an analysis of microhabitat use by *P. semispinosus* in tropical moist forests in central Panama." (Lambert and Adler, p. 71)
- **Your "address" example**:

Develop one sentence for each of the following

What is your study question? (This is used later in the discussion section)

1. Describe the problem area you addressed (e.g., weeds in wheat),

2. What are the objectives and knowledge gap you are addressing (e.g., new weed, new product, new cropping system)

6. Discussion and conclusions

Discussion Keypoint. The Discussion describes _____ the results could be _____ (what the reasons might be for the patterns found or not found)

Activity.

What was your study question (gap or need being addressed)?

_____

What do you see as the main points of interest? Make a list of all your ideas that you might discuss related to your study question and your study findings. How has your data answered your question and filled the "gap" (i.e., your study question)

Indicate any idea(s) that seem more important to highlight.

Work out any logical relationships between the ideas and develop a logical flow of ideas.

What point is most clearly made by your data?

Conclusion.

Indicate which is true for your work:

1. The findings are conclusive - research is complete,
2. There is a need for further validation of inconclusive results,
3. There is a need for further investigation based on research output gaps.

Conclusions should be based on objectives and any recommendations are clearly stated in this section.

7. Abstract!

Keypoint. The Abstract is a _____ of paper, (generally between 50-100 words) indicating:

1) The main _____ for the study (Why)
2) the primary _____ (What you found), and
3) the main _____ (What it means).

- an introductory sentence,

- the specific question addressed (1 sentence),

- The main techniques or procedures (when and where was it conducted, if applicable; your sample size; the specific species, proteins, genes, etc., studied), (1 sentence)

- The main results (2-3 sentences),

- The main conclusion (1 sentence).

Critique the following. Does it have the 3 elements above?

1. The main reason for the study (Why) Yes/No
2. the primary results (What you found), Yes/No
3. the main conclusions (What it means). Yes/No

Example Abstract.

One of the major environmental factors limiting plant productivity is lack of water. This is especially true for the major cereals maize, rice, and wheat, which demonstrate a range of susceptibility to moisture deficit. Although conventional breeding and marker-assisted selection are being used to develop varieties more tolerant to water stress, these methods are time and resource consuming and germplasm dependent. Genetic engineering is attractive because of its potential to improve abiotic stress tolerance more rapidly. Transcription factors have been shown to produce multiple phenotypic alterations, many of which are involved in stress responses. DREB1A, a transcription factor that recognizes dehydration response elements, has been shown in Arabidopsis thaliana to play a crucial role in promoting the expression of drought-tolerance genes. In our efforts to enhance drought tolerance in wheat, the A. thaliana DREB1Agene was placed under control of a stress-inducible promoter from the rd29A gene and transferred via biolistic transformation into bread wheat. Plants expressing the DREB1A gene demonstrated substantial resistance to water stress in comparison with checks under experimental greenhouse conditions, manifested by a 10-day delay in wilting when water was withheld.

Key words: Wheat transformation, MPB Bobwhite 26, DREB1A, rd29 promoter, moisture stress tolerance.

Reference: Alessandro Pellegrineschi, Matthew Reynolds, Mario Pacheco, Rosa Maria Brito, Rosaura Almeraya, Kazuko Yamaguchi-Shinozaki, David Hoisington. *Genome*, 2004, 47(3): 493-500, 10.1139/g03-140.

***Note on Keywords*.** List _____ - _____ keywords (preferably arranged _____)

8. Revisit your Title. The subject and what aspect of the subject was studied.

Original?

_____

Rewrite?

_____

Literature Cited (References).

List all references cited and follow the _____ or publishers' guidelines.

Note – a word on Plagiarism?

The practice of taking _____ else's work or ideas and passing them off as one's _____

When is it okay to copy someone's work?

How is it done appropriately?

Appendix. Example data sets (if needed).

Table 1.1. Production trial results.

			Site				
Level of N	**Level of P**	**Level of H**	**4**	**5**	**7**	**9**	**10**
			Yield (t/ha)				
0	0	0	2.71	1.77	1.87	4.01	1.06
0	0	1	3.83	1.85	2.38	3.71	1.66
0	1	0	2.17	1.51	1.58	2.66	1.00
0	1	1	4.21	2.11	2.10	3.85	1.69
1	0	0	3.60	3.99	3.60	5.37	1.98
1	0	1	5.20	4.67	4.08	5.22	2.19
1	1	0	2.96	3.95	4.16	5.09	2.39
1	1	1	4.96	4.74	4.17	5.36	2.85
Average			3.70	3.07	2.99	4.40	1.85
LSD 5%			0.83	0.82	0.27	1.10	0.60

Table 1.2. Yield gap and main effects of the production trial.

Site	Treatment effects $N_1P_1H_1$-$N_0P_0H_0$	N effect $\sum(N_1-N_0)$	P effect $\sum(P_1-P_0)$	H effect $\sum(H_1-H_0)$
4	2.25	0.95	-0.36	1.69
5	2.97	2.53	0.01	0.54
7	2.30	2.02	0.02	0.38
9	1.35	1.70	0.34	0.25
10	1.79	1.00	0.26	0.49
Average	2.13	1.64	0.05	0.67

Fertility trial results

A 5x5 (N x P) incomplete factorial **(Table 13**) with a K satellite treatment (150:100:75) (total of 14 treatments) with three replications was sown at 5 sites. N applications were split (half at seeding, half at 35 DAE). The variety Genaro T 81 was planted at 120 kg/ha. Weeds were controlled using Brominal (1 L/ha) + 2,4-D (1 L/ha) and Doxan (4 L/ha). Where necessary, aphids were controlled using Metasystox (2 L/ha). Plot size varied from (4 x 10) to (5 x 10) m^2.

Table 1.3. Treatment combinations (X) used in fertility trials.

	Kg P_2O_5/ha				
Kg N/ha	0	50	100	150	200
0	X		X		X
50		X		X	
100	X		X		
150		X		X	
200	X		X		X

There was no response to either P or the K satellite treatment, but generally large responses to N (Table 6).

Table 1.4. Fertility trial results.

Level of N	Site					
	1	**3**	**6**	**7**	**10**	**Average**
0	5.36	4.06	3.08	2.23	2.18	3.38
50	5.47	5.08	4.51	3.88	2.86	4.36
100	5.37	5.57	5.27	4.65	2.87	4.75
150	5.45	5.31	5.32	4.85	2.79	4.74
200	5.50	5.20	5.60	4.83	3.07	4.84
Average	5.42	5.03	4.82	4.09	3.88	
LSD 5%	0.31	0.84	0.71	0.98	0.61	0.66

Variety trial results

Ten varieties-including six bread wheats, two triticales (Tcl), and two barleys (B) **(Table** 15) were sown at a density of 120 kg/ha at 5 sites with 2 replications. Trials were fertilized with 150:75 (N:P_2O_5-half N at seeding and half at 35 DAE) and weeds were controlled using Brominal (1 L/ha) + 2,4-D (1 L/ha) and Hoxan (4 L/ha). Where necessary aphids were controlled using Metasystox (2 L/ha). Plot size varied from (4 x 10) to (4 x 25) m^2.

Table 1.5. Variety trial results.

	Site					
Variety	**4**	**7**	**9**	**10**	**11**	**Average**
	Yield (t/ha)					
Eronga(Tcl)	5.98	4.03	6.15	4.32	5.14	5.12
PavonF76 (BW)	5.35	3.54	5.54	3.93	2.91	4.25
OpataM8 (BW)	5.24	4.07	6.02	2.97	2.86	4.23
Alamos (Tcl)	5.19	2.92	5.49	3.94	3.26	4.16
GenaroT81 (BW)	5.46	3.41	4.91	2.54	3.18	3.90
Galvez (BW)	4.45	3.35	4.72	2.86	2.79	3.63
Gloria/Comanche (B)	4.33	3.73	3.78	2.66	2.27	3.35
Mexico 82 (BW)	3.77	2.85	3.74	4.14	1.62	3.22
Salamanca (BW)	3.76	2.53	4.45	2.99	1.69	3.08
Centinela (B)	2.94	2.90	3.87	2.53	1.35	2.72
Site Average	4.20	3.33	4.87	3.29	2.71	
LSD 5%	1.41	0.85	1.97	0.96	1.36	0.65

Tcl = Triticale; BW = Bread wheat; DW = Durum wheat; B = Barley

Date of planting trial results

Four varieties representing materials of differing growth cycles were planted at 120 kg/ha across three planting dates, May 20, June 10, and June 30 **(Table** 16), with three replications at two sites. Trials were fertilized with 150:75 (N:P_2O_5) (half N at seeding and half at 35 DAE) and weeds were controlled using Brominal (1 L/ha) + 2,4-D (1 L/ha) and Iloxan (4 L/ha). Where necessary aphids were controlled using Metasystox (2 L/ha). Plot size was (4 x 10) m^2.

Table 1.6. Date of planting trial results.

		Site		
Variety	Date of sowing	5	6	Average
		Yield (t/ha)		
Eronga (Tcl)	May 20	5.70	4.97	5.34
	June 10	5.50	5.74	5.62
	June 30	2.60	3.25	2.93
GenaroT81 (BW)	May 20	4.30	4.64	4.47
	June 10	5.30	5.75	5.53
	June 30	4.00	5.21	4.61
Galvez (BW)	May 20	4.20	3.00	3.60
	June 10	5.00	5.41	5.21
	June 30	4.50	4.74	4.62
Salamanca (BW)	May 20	2.90	2.45	2.68
	June 10	4.00	4.95	4.48
	June 30	x	5.11	5.11
Average		4.00	4.60	
LSD 5%		0.57	0.70	

Herbicide trial results

Ten treatments aimed primarily at broadleaf weed control (Table 17) were planted at three sites with three replications at each. The variety Genaro T 81 was planted at 120 kg/ha and fertilizer at a rate of 150:75 ($N:P_2O_5$) was applied (half N at seeding and half at 35 DAE). Where necessary aphids were controlled using Metasystox (2 L/ha). Plot size varied from (4 x 8) to (4 x 10) m^2.

Table 1.7. Herbicide trial results.

	Site			
Treatment	1	2	8	Average
	Yield (t/ha)			
Non-weeded	4.87	0.57	1.72	2.39
2,4-D 1 L/ha 35 DAE	5.58	0.80	3.97	3.45
2,4-D 2 L/ha 35 DAE	5.89	1.67	4.26	3.94
Brominal 2 L/ha 15 DAE	5.60	4.27	3.10	4.32
Basagran 2.5 L/ha 15 DAE	4.99	1.82	2.90	3.24
Glean 20 g/ha 15 DAE	5.39	0.77	3.44	3.20
Brominal 1 L/ha + Basagran 2.5 l/ha 15 DAE	5.81	3.87	3.61	4.43
Glean 20 g/ha 15 DAE + Brominal 1 l/ha 25 DAE	5.65	4.36	3.15	4.39
Glean 20 g/ha + Brominal 1 L/ha 15 DAE	5.64	3.51	3.60	4.25
Glean 20 g/ha + Basagran 2.5 L/ha 15 DAE	5.37	2.29	3.42	3.69
Average	5.48	2.39	3.32	
LSD 5%	0.70	1.56	0.90	0.62

DAE = Days after emergence.