



Backward Design to Promote Tangible Outcomes in Graduate Student Professional Development

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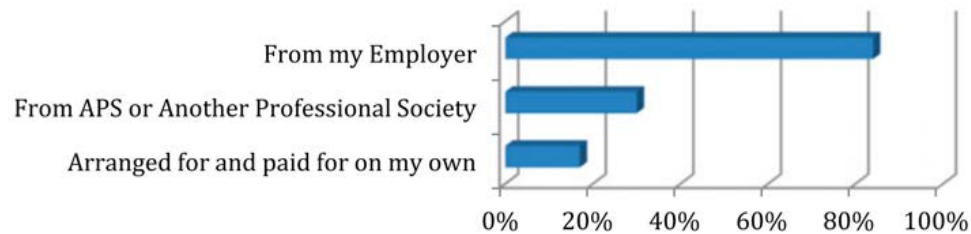


NACTA 2019
Scholarship of Teaching & Learning
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Context for the Course

Why is professional development important for graduate students?

Where did you receive your training?



Reasons for not receiving training



Beckerman & Schneider 2016

Students are entering careers without necessary training

When training is obtained:

- Only 4% from formal classes
- 72% of training is self-directed

Study finds that participants consider **intentional learning** opportunities desirable

Context for the Course

Why is professional development important for graduate students?

Richter et al. 2018

Top Skills Employers Want

- Teamwork
- Adaptability
- Communication
- Time Management

AAAS Consensus Report 2018

Core Elements of Graduate Training

- Work collaboratively
- Develop management skills
- Communicate with many audiences (STEM fields, policymakers, & public)

CASNR Strategic Framework 2018

Goal: determine the vision for graduate education

FWLPMIAHKRSFACULTYND
XREUQITZPXO7SDMAKQIYA
GMI GRADUATE XETZLRNL3S
KTNYMA STEM KUPWIWKGBRM
ECQFO EDUCATION RSEJTNZ
NSLGBXP AFORXTHEHPXLIR
TWHADS 21ST CENTURY OHY
BA4PXIAEXTMOJYFXIUNXS
JSCAREERABTFRPRAHOT6E
8JATWMIPMAE4STUDENTSQ
XCXHDOK5XZ1OX7SDMAKPH



**Success in
the Sciences
Summer 2018**



**Students in Interdisciplinary
Life Sciences**

- Agronomy & Horticulture
- School of Biological Sciences
- Biochemistry
- Chemical Engineering
- Plant Pathology



**Success in
the Sciences
Summer 2018**

8 week Format
Meeting for 2hrs, Twice
per week





**Students in Interdisciplinary
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- Chemical Engineering
- Plant Pathology

Design Team

- Complex Biosystems Grad Students
- Faculty Sponsor in Plant Pathology
- Instructional Design Coordinator

**Success in
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**Large Variability in Prior
Experience & Grad Training**

- Some with 3+ years
- Others with <1 year

Design Goals

Empower students to make individualized goals to achieve “success” in graduate school and beyond

What does the university offer to help me in my program?

Student
Wellness
01

Research
Activities
02

What makes a ‘good’ quality research paper?

What about careers outside academia?

Job
Searches
06



Scientific
Writing
03

How do I decide which journal to submit to?

How do I prepare for scientific presentations?

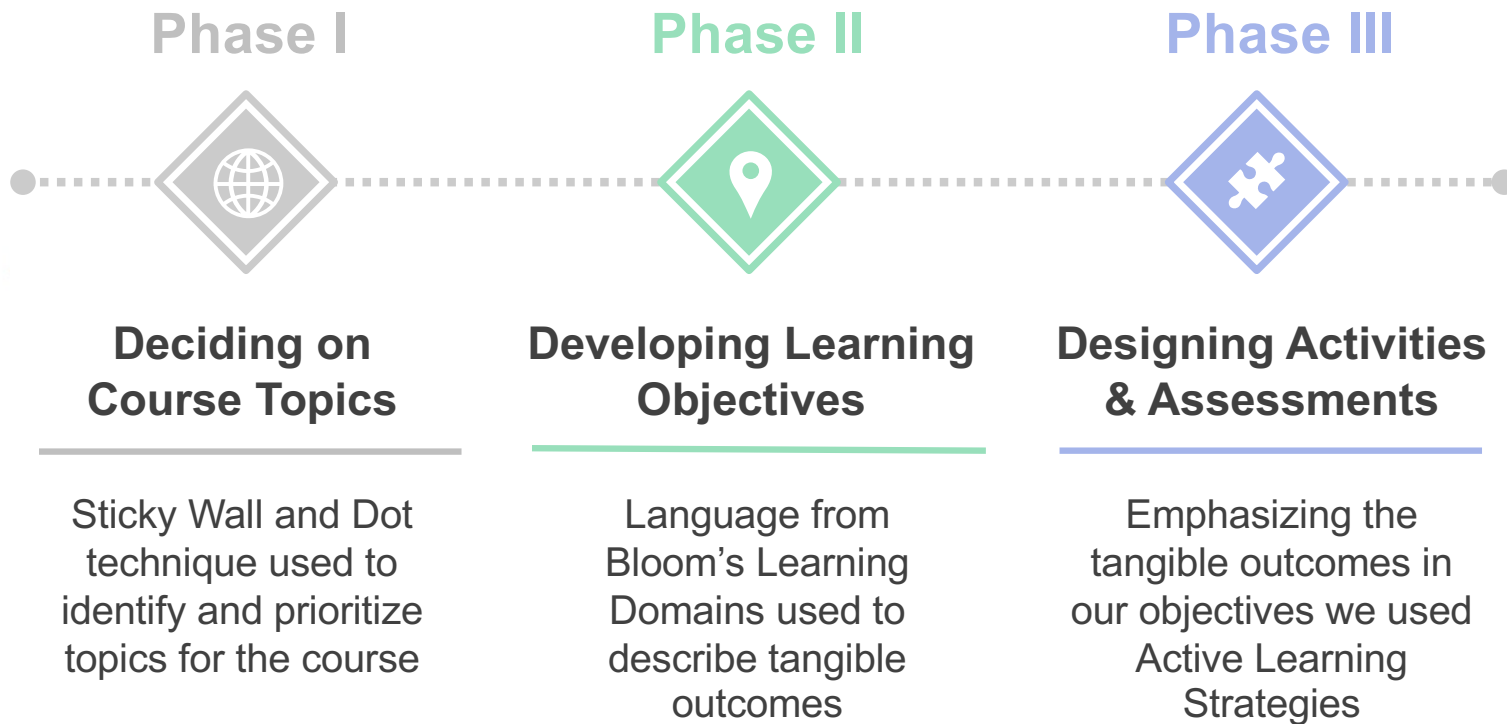
Networking
& Meetings
05

Social
Media
04

Do I need to be on twitter to get a job?

Backward Design

How did we create this course?



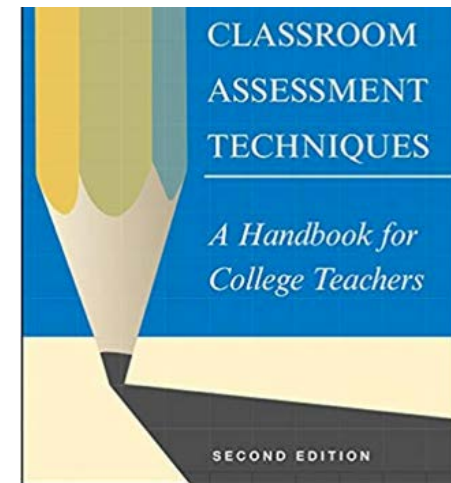
Phase I – Sticky Wall & Dot

What is our intention for the course?

Teaching Goals Inventory : Cluster Scores

	A	B	C	D	E
	Cluster Number and Name	Goals Included	Sum of Ratings Given to Goals in That Cluster	Divide C by This Number	Your Cluster Scores
I.	Higher-Order Thinking Skills	1-8	_____	8	_____
II.	Basic Academic Success Skills	9-17	_____	9	_____
III.	Discipline-Specific Knowledge and Skills	18-25	_____	8	_____
IV.	Liberal Arts and Academic Values	26-35	_____	10	_____
V.	Work and Career Preparation	36-43	_____	8	_____
VI.	Personal Development	44-52	_____	9	_____

Angelo & Cross 1993



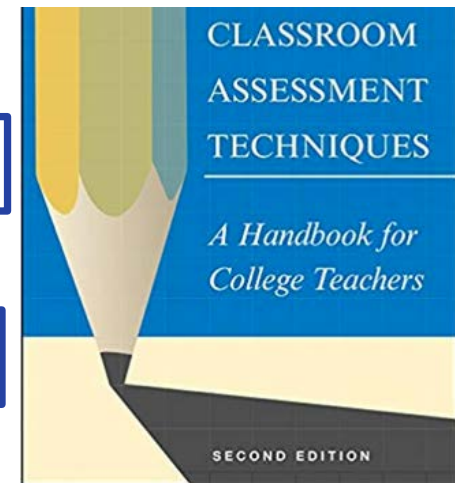
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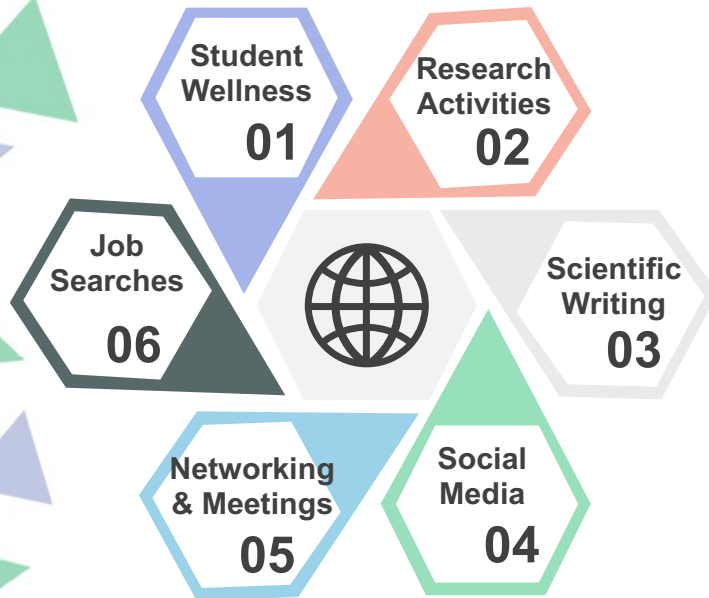
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I.	Higher-Order Thinking Skills	1-8	<u>27.5</u>	8	<u>3.43</u>	3
II.	Basic Academic Success Skills	9-17	<u>19.5</u>	9	<u>2.16</u>	
III.	Discipline-Specific Knowledge and Skills	18-25	<u>28.5</u>	8	<u>3.56</u>	2
IV.	Liberal Arts and Academic Values	26-35	<u>20</u>	10	<u>2.00</u>	
V.	Work and Career Preparation	36-43	<u>33</u>	8	<u>4.13</u>	1
VI.	Personal Development	44-52	<u>24</u>	9	<u>2.66</u>	

Angelo & Cross 1993



Phase I – Sticky Wall & Dot

Method for Identifying and Prioritizing Tasks & Topics



Sticky Wall & Dot is a collaborative method with immediate feedback

Steps:

- Take general concepts and brainstorm lists of topics that fit the goals of the clusters (Identify)
- Annotate list with priorities for the course (Prioritize)

Phase I – Sticky Wall & Dot

Developing Skills for Critical Evaluation of Primary Lit.

- ✓ Synthesis (cnx's btwn papers)
 - Do experiments answer questions - meet obj of intro
 - Do conclusions match experiments
- Primary vs. Review vs. OPINION
 - How to tell if story is good
- Scientific Mevit
 - Fact checking popular press articles
- ✓ How to break down complex papers & organize a body of literature - infographics
 - Guidance to writing it
- Peer Review - Mock Review Panel w/ discussion
 - Collaboration - work together to write

Outline Process for Publishing Scientific Works

- Identifying Journals
 - Impact factor / audience
- Timeline
 - parts of a paper & tense
 - open vs. paid
 - Story-telling in science
- pre-prints → peer review process
 - Making data public
 - Style guide
 - book data?
- questions reviewers ask when reading your paper
- responding to reviewer comments
- understanding how decisions by editor are made
 - (about Review Activity)
- OSF - analysis process

Confidently present scientific research at a level for conf.

- ✓ What to present - Poster, talk, Lighting
- Where to present - Size of Meeting
- When to present - rec'd by, non-publishing, unpublished
- How set up / design Poster / Talk
- ✓ Audience - sub-discipline, broad, "lay", kids
- Meeting Considerations - Pay to submit abstract
 - open vs paid proceedings
 - getting people to come see your poster and/or hear your talk
- Networking via your poster
- Recording or not - do I pay to attend?
- Story-telling in science (Part 2, transition good w. book, video)

Introduce Resources available to graduate students at UNL

- Library
- Your advisor
- other profs / students & committee
- Grad Studies Website
- Writing Workshops - Dr. Waters (By Hart)
- Mentored Speakers - Finding Seminars of Interest
- Travel Awards
- Ombuds / grievances
- Fellowship opportunities - when / how find
- Faculty Guest Spkrs - Hybrid (industry), Local (US)
- UNL Digital Commons
- Mental health CARE

Social Media

- ✓ Professional Twitter account
- Pre-print open reviews / Poster sessions
- Facebook - pitfalls / Google image search
- ResearchGate
- Metrics from these sites
- Job interviews
- Networking
- Public vs. private info.
 - Twitter/email protecting yourself
- UNL / Personal website
 - getting invited for this
 - interviews + News Conans.
- politics & science & funding & free speech & risk - Kevin Folta

Extra

- Ethics - Research Integrity
- Hierarchy in a Lab - Resource when in a Lab - Navigating work in a Lab
- Hands-on Practice - 'Review Panel'
- Annual reviews / reports / impact
- ID Protection - avail / info on interests / age, schooling, where is the threat
- What is success?

HDMI #1 - Computer → log on w/ UNL ID

- #2 - Connect laptop via table HDMI input
- #3 - Apple Play
- #4 - Microsoft mirror

Mic / Speaker through phone
* USB connection must be selected

Professional goals

- Time management - prioritizing
- Speaking skills → Literature on # hrs worked
- Know your strengths & weaknesses → when to take break & when to not
- Mentoring (now & in future) → the culture of over-working
- Being Mentored
- Prioritize skills you need post-grad career
- Writing e-mails / culture & style
- Texting etiquette
- How to Prep for Next-stage - write CV, Statement - when apply / reach out - How to deal w/ opt-out before they applied
- Summer Workshops + Travel (DOE lab, ByDun Hill)
- Implicit bias +/-
- Expectations of advisor / GRA / credit hrs & holiday time off & "Face time"

Phase I – Sticky Wall & Dot

The sticky wall is divided into several main sections:

- Developing Skills for Critical Evaluation of Primary Lit.**
 - Synthesis (cnxs btwn papers)
 - Do experiments answer questions - meet objectives
 - Do conclusions match experiments
 - Primary vs. Review vs. OPINION
 - Scientific Merit
 - Fact checking popular press articles
 - How to break down complex papers & organize a body of literature - infographics
 - Peer Review - Mock Review Panel / discuss
 - Collaboration - work together to write
 - Politics of publishing
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 - What to present - Poster, talk, Lecture
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- Social Media**
 - Professional Twitter account
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 - understanding how decisions by editor are made
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 - UNL-Digital Commons
 - Mental health
- Extra**
 - Ethics - Research Integrity
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 - MD protections - avail. available/info on interests/age/schooling where is the line?
 - What is success?
- Professional goals**
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 - Writing e-mails / culture & style
 - Texting etiquette
 - How to Prep for Next-stage - how to identify opportunities
 - Summer workshops + Travel (DOE lab, BigData Hub)
 - Implicit bias +/-
 - Expectations of advisor/GRA/corridors & holiday time off & "face time"

On the right side, three colored boxes categorize the content:

- Essential** (Blue box)
- Important** (Pink box)
- Extra** (Yellow box)



Phase II – Learning Objectives

What do we want students to get out of the course?

Goal: encapsulate tangible outcomes in the language of learning objectives

Bloom's Taxonomy of Learning Domains

Knowledge

Analysis

Comprehension

Synthesis

Application

Evaluation

Learning Objectives facilitate the **intentionality** that is a key component of backwards design

Phase II – Learning Objectives

Creating Learning Objectives: from topics to outcomes

Topic of Interest: Develop skills for critical evaluation of primary literature

Brainstorm from Phase I:

- How to break down complex papers and organize literature (infographics)
- How to tell if a story is “good”
- Synthesis – connections between papers
- Politics of publishing
- Do experiments answer question and do conclusions match experiments

Learning Objective: Deconstruct the parts of a scientific story and assess the quality of the story

Bloom’s Learning Domains: Analysis and Evaluation

Phase II – Learning Objectives

3 Topical Themes, each with 4 objectives

Topical Theme 1

Exploring, Developing,
and Implementing
Concepts in Scientific
Storytelling

Topical Theme 2

Identifying and
Deconstructing the
Process and Pitfalls of
Publishing

Topical Theme 3

Examining, Building,
and Integrating
“Success” in your
Scientific Career

12 Learning Objectives in all



Phase III – Assessing Outcomes

How can we facilitate “tangible” outcomes?

Goal: encourage participants to develop individualized artefacts

Assessments

Examples:

- Minute papers
- Reflective writing
- Summative Project

Resources:

Classroom Assessment Techniques
Angelo & Cross 1993

Activities

Active Learning Techniques:

- Gallery Walk
- Think, Pair, Share
- Jigsaw
- and more!

Collaborative Learning Techniques
Barkley, Major, & Cross 2014

Phase III – Assessing Outcomes



Classify strengths and weaknesses and **develop** strategies suited to your personality to achieve your “success”

Bloom’s Domains: Comprehension & Synthesis

Before class: 16 Personalities test

In-class: Apply the discussion to a real-world scenario

Design an 8-week program for a summer REU student

Two groups of students:

- Organization & Structure (J)
- Easy-going & Flexible (P)



“DEFENDER”
ISFJ (-A/-T)



“LOGISTICIAN”
ISTJ (-A/-T)



“ADVOCATE”
INFJ (-A/-T)



“VIRTUOSO”
ISTP (-A/-T)



“ADVENTURER”
ISFP (-A/-T)



“CAMPAIGNER”
ENFP (-A/-T)

Activities

Phase III – Assessing Outcomes



Classify strengths and weaknesses and **develop** strategies suited to your personality to achieve your “success”

Bloom’s Domains: Comprehension & Synthesis

Assessments

Minute paper

“Knowing a colleagues MBTI could change how you'd interact or plan about them”

Reflective Writing

“If I knew my advisor’s personality traits would make our partnership easier and help me be aware what was expected of me as his student and what to expect with him as my advisor. Hopefully, it would make me a better member in his lab.”

Summative Project

“I will need to work on getting used to planning out tasks and delegating as well as working with people when things aren’t going the way that was expected. Things I hope will be easy for me will be listening and acting on the needs of my future students.”

Phase III – Assessing Outcomes



Classify strengths and weaknesses and **develop** strategies suited to your personality to achieve your “success”

Bloom’s Domains: Comprehension & Synthesis

Activities

Discussion, collaboration, & evaluation of traits in different scenarios

Assessments

Self-reflective evaluation & application to individual career paths

Tangible Outcomes

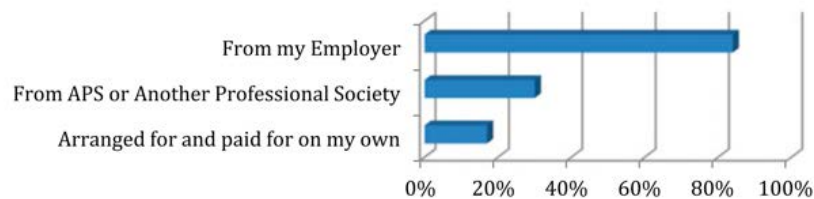
List of personality features that describe the student and an outline of potential strategies for being mentored and mentoring

Skills desired by employers: Teamwork, Adaptability, Communication

Promoting Intentional Learning

Why is professional development important for graduate students?

Where did you receive your training?



Reasons for not receiving training



Beckerman & Schneider 2016

Success in the Sciences is a unique class designed to address these needs

Intentionality in design is translatable to other courses:

- Encapsulating tangible outcomes with learning objectives
- Developing in-class activities to support objectives
- Integrating assessments to build on activities and objectives

Thank you!



Contact us with any questions!

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