

# The Department of Chemistry and Biochemistry Teaching Assistant Handbook

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*This Teaching Assistant handbook is dedicated to Mr. Jabs, Prof. E. Bock, and Prof. T. Schaefer, all of whom inspired me and contributed to my becoming a graduate student in chemistry.*

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# 1 Looking Into the Mirror: Learning About Yourself

Before learning how to be a good Teaching Assistant (TA), you may find it useful to be introspective and learn more about what you expect of yourself and others. Your goals and sources of inspiration will profoundly affect what kind of a TA you will become. Let's learn something about *you*...

## 1.1 Why Are You Studying Chemistry?

Well? Why choose chemistry? Many graduate students in chemistry trace their choice of discipline back to a single teacher or professor—an individual that was at the same time inspired and inspiring, enthusiastic and challenging. Is the same true of your chemistry experience? Were you particularly inspired by one teacher? Part of our *raison d'être* as chemistry TAs is to be *that* teacher.

## 1.2 Your Own Teaching Philosophy and Course Objectives

What are your teaching objectives? What are the course objectives? What is your teaching philosophy? These are questions that this handbook cannot answer. Take a few moments and think about what you expect of yourself and what you expect of your students. Discuss your expectations with your students.

## 1.3 Objectives of the University of Guelph

Arising from the Aims and Objectives Report, the following Objectives were approved by the Senate of the University of Guelph in 1987. They are described in terms of the desired characteristics of educated graduates and are used to guide educators in their approaches to educating university graduates:

1. Literacy
2. Numeracy

3. Sense of Historical Development
4. Global Understanding
5. Moral Maturity
6. Aesthetic Maturity
7. Understanding of Forms of Inquiry
8. Depth and Breadth of Understanding
9. Independence of Thought
10. Love of Learning

An explanation of the Learning Objectives of the University of Guelph is available in the Undergraduate Calendar<sup>1</sup>.

## 1.4 Your Teaching Style

Each of us has our own unique and distinct learning and teaching styles. For example, some prefer tight focus to be held at all times during a lecture while others prefer conjecture and tangents. The type of learner that you are will indicate your preference for teaching style. In turn, your teaching style will be more accessible to those students which have learning styles similar to yours. In order to effectively teach a class of individuals with diverse learning styles you should be aware of your own learning style and implications this has for your teaching style.

### 1.4.1 Myers Briggs Personality Type Indicator (MBTI)

(Source: Adapted from “Learning Styles”<sup>2</sup> in “TA Handbook 1998–99” [1])

MBTI can be used to classify individuals in terms of four categories: extroverted/introverted, sensing/intuiting, thinking/feeling, and judgement/perception.

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<sup>1</sup>This document can be accessed by going to [http://www.uoguelph.ca/undergrad\\_calendar/](http://www.uoguelph.ca/undergrad_calendar/) and following the links contained therein.

<sup>2</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah2f.html>.

Each of these dimensions has implications for students and teachers. The MBTI categories are<sup>3</sup>:

1. Extroverted/Introverted

**Extroverted** teachers tend to develop “student centred” courses and classrooms. They prefer active instruction full of discussions, group projects, and experiential learning.

**Introverted** teachers tend to develop “teacher centred” courses and classrooms. They prefer lectures to discussions, and tend to structure learning tasks from textbooks.

2. Sensing/Intuitive

**Sensing** teachers keep instruction focused on a narrow range of choices, and usually concentrate on factual and concrete questions.

**Intuitive** teachers are likely to have a wide range of choice of assignments. They also tend to focus on questions of conjecture, such as “what if . . . ?”

3. Thinking/Feeling

**Thinking** teachers tend to treat class members as a collective, and excel at challenging students, although they may offer little personal feedback.

**Feeling** teachers tend to treat class members as individuals, and attempt to attend to every student’s needs. They likely motivate through praise and empathy.

4. Judging/Perceiving

**Judging** teachers tend to develop orderly classrooms, with clearly specified schedules and deadlines.

**Perceiving** teachers tend to develop more spontaneous classrooms, those with more movement, open-ended discussion and flexible schedules.

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<sup>3</sup>See <http://www.gsu.edu/dschjb/wwwmbti.html> for a more detailed description.

## 1.4.2 MBTI Implications for Teaching and Learning

(Source: Adapted from “Learning Styles”<sup>4</sup> in “TA Handbook 1998–99” [1])

The following are some ideas to keep in mind as you reflect on the connection between your teaching style and the students’ learning styles:

1. Recognize your own style and how it influences the way you teach;
2. Remain true to your style, teaching from your strength, but be flexible enough to allow students to employ their preferred approaches to learning;
3. If you prefer to lecture, allow some time for class discussion;
4. If you prefer to teach facts and details, also discuss theories and concepts;
5. If you prefer to “challenge” students, learn supportive ways of doing so;
6. Vary your assignments; give exams that call on students to think in different ways;
7. Encourage students to value different learning styles and orientations.

## 2 Teaching: A Profession

### 2.1 Today’s Students are Tomorrow’s Leaders

We should never take shortcuts in teaching—today’s students are tomorrow’s leaders. To aid in the preparation of tomorrow’s leaders you should consider discussing with them the characteristics of a successful student:<sup>5</sup>

(Source: Adapted from “Helping Your Students to Become Successful Students”<sup>6</sup> in “TA Survival Guide 1999–2000” [2])

Successful students. . .

- are responsible and active. Successful students get involved in their studies and labs, accept responsibility for their own performance and education, and are active participants in it!

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<sup>4</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah2f.html>.

<sup>5</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah3c.html>.

<sup>6</sup>Available at <http://www.tss.uoguelph.ca/tasg/tasg2b.html>.

- ask questions. Successful students ask questions to provide the quickest route between ignorance and knowledge.
- learn that a student and a professor make a team. Most instructors want exactly what their students want: they would like them to learn the material in their respective classes and earn a good grade.
- talk about what they're learning. Successful students get to know something well enough that they can put it into words.
- don't cram for exams. Successful students know that divided periods of study are more effective than cram sessions, and they practice it.
- are good time managers. Successful students do not procrastinate. They have learned that time control is life control and have consciously chosen to be in control of their life.

## 2.2 Fostering a Love of Knowledge

The following suggestions might be useful to help foster an environment that respects knowledge and learning:

**(Source: Adapted from “Motivating Students”<sup>7</sup> in “TA Handbook 1998–99” [1])**

1. Share your love and fascination for your discipline with your students. Talk about why you chose to major in it. Tell stories about favourite, inspiring faculty you've had. Share your research interests and career aspirations. Take every opportunity to be enthusiastic.
2. Show how the study of your discipline connects to every day “real” life. Help students to see how studying this subject can have an impact on their lives, careers, society, culture, country, health, and happiness. Regularly discuss current events related to the discipline. One particularly excellent source of relevant news in science is the BBC Science and Technology Page<sup>8</sup>.
3. Show your students how your discipline is connected and related to other subjects, particularly those where the connection may not be obvious.

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<sup>7</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah7e.html>.

<sup>8</sup>Available at <http://news.bbc.co.uk/hi/english/sci/tech/default.htm>.

4. Discuss areas of disagreement or contention among experts in the discipline. Integrate interesting discipline-specific controversies into the curriculum wherever possible, and give students an opportunity to discuss them (Refer to the “Ethics in the Classroom”<sup>9</sup> section of the TA Handbook [1] for specific suggestions).
5. Make your class a “safe” place and a place of inquiry for students. Assure your class that there are no “stupid” questions—questions are the building blocks of the scientific process.

### 2.3 The Ombudsperson: Empowering Your Students

It is *strongly* recommended that in the very first encounter with your students you encourage their feedback and input. While you may prefer that students see you on an individual basis to voice concerns, first year undergraduates are often intimidated by the university experience and will not make their frustrations known to you directly. Clear and immediate feedback is invaluable to both teacher and student so that areas of concern can be immediately addressed.

One way to achieve clear, immediate, and ongoing feedback from your class is to have them elect two ombudspople, one male and one female, who will canvas the class on a weekly basis and report back to you with short summary of *anonymous* statements of how the class perceives you as a TA. There are several advantages to having ombudspople relay the feelings of students to you:

- Immediate feedback immediately ameliorate minor problems such as speaking too quietly.
- The ombudsperson offers a vehicle through which students can vent their frustrations. If effectively dealt with, such frustrations are less likely to be reflected in your TA evaluation.
- The existence of the post of ombudsperson reflects your respect for your students.
- The opinions offered through the ombudsperson will help you become a better TA.

### 2.4 Tips on How to Be a Successful Teacher

Successful teachers excel at both the intellectual and interpersonal dimensions of teaching [3]. These two dimensions will be discussed separately.

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<sup>9</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah5a.html>.

### 2.4.1 The Intellectual Dimension

Four factors are central to excelling in the intellectual dimension. These are:

1. Course content should be organized and presented clearly.
2. Relationships among different concepts should be stressed (see section 2.2, page 8).
3. Content should be presented in a dynamic way with high energy (see section 2.2, page 8).
4. Let your fascination with and love of teaching and research show:
  - Speak of your own research and that of your colleagues. Speak of problems that you have not resolved. Show that the university is a community of inquiry and that it is OK not to know so long as you are driven to find out.

### 2.4.2 The Interpersonal Dimension

Three factors are necessary to develop fully the interpersonal dimension. These are:

1. Treat students as individuals:
  - Be respectful of individual needs, learning styles, personalities, *etc.*.
  - Recognize that your students are responsible and that you expect them to behave as such.
2. Encourage students to ask questions or express personal opinions:
  - Have the class elect two ombudspeople—one male, one female (see section 2.3 on page 9).
  - Sometimes individuals must be encouraged to participate in discussions. By encouraging the participation of *all* members of the class you are sending a strong message to your class on fairness and the respect of all individuals.
  - Encourage feedback from your class. See the “Asking For Feedback”<sup>10</sup> section of the TA Handbook [1].

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<sup>10</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah8d.html>.

3. Behave in a fair, positive, and consistent manner towards students:
  - Be firm but fair. Set the tone of the laboratory from the very first day.
  - Try to eliminate gender, race, and culture specific idioms from your discussions. Before drawing an analogy, stop to think if the subject of the analogy is equally familiar to all the members of your class.
  - Don't expand on your job description if you feel that you are being manipulated or biased. Refer students to the appropriate person<sup>11</sup> rather than attempting to counsel students yourself.
  - See also "Maintaining Professional Relationships"<sup>12</sup> and "Managing Difficult Student Behaviours"<sup>13</sup> sections of the TA Handbook [1].

## 2.5 Acting Professionally

It is natural for a TA to sympathize with the plight of a struggling student. While it may be a temptation to stand in solidarity with your students by adopting an "us against them" attitude, you are cautioned against doing so for the following reasons:

1. You are a paid professional and are expected to act as such.
2. You are employed to be a teacher of chemistry. While you may be *friendly* towards your students, being a *friend* may prevent you from acting fairly and impartially.

## 2.6 Improving Your Teaching Skills: UTTP

One excellent way to improving your teaching skills is to enroll in "UNIV\*6800 University Teaching: Theory and Practice (UTTP)"<sup>14</sup> at the University of Guelph.

### 2.6.1 UTTP Format

UTTP meets twelve times over the fall and winter semesters and attracts approximately 60 students from across campus each year. UTTP may be taken for credit or certificate. University of Guelph faculty join the class as guest speakers to share their teaching philosophies, techniques and ideas. Students are expected

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<sup>11</sup>See <http://www.tss.uoguelph.ca/tasg/tasg2c.html> for a list of resources.

<sup>12</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah7f.html>.

<sup>13</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah4i.html>.

<sup>14</sup>See <http://www.tss.uoguelph.ca/uttp.html> for additional information.

to actively participate in class discussions, attend a workshop at which they are videotaped making a presentation, plan and deliver a “live” lecture or seminar in their own department, and prepare a teaching portfolio.

### 2.6.2 UTTP Registration

Students who are interested in registering for UTTP should call 824-4120 ext. 2936.

## 3 International Students

### 3.1 Being One

There is an excellent section on being an international TA in the “The International TA”<sup>15</sup> section of the TA Handbook [1]. A few salient points taken from this source and others are:

1. Speak with other, more experienced international TAs in your department to learn from their advice and experiences.
2. If English is not your first language you may wish to address this issue with your students. Explain the origin of your accent. Suggest that they let you know immediately if they do not understand something you have said.
3. Minimize language difficulties by avoiding the use of words that are hard for you to pronounce. If the use of such words was desirable or necessary, ask your class if they understood you.
4. An informal atmosphere (see section 5.1, page 16 for tips on setting the atmosphere for your lab) may make your students feel more at ease and tolerant. If you choose to adopt a more informal policy, try to be available before or after the laboratory to chat with your students.
5. You may choose to discuss some aspects of your academic and cultural background with your class. Ask your students to introduce themselves and whatever aspects of their background that they feel comfortable discussing. This type of exchange will show your students (and you) that while cultural differences exist, humanity is universal.

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<sup>15</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah1e.html>.

## 3.2 Dealing With Them Fairly

In dealing with international students it is very important to develop the interpersonal skills mentioned in section 2.4.2, page 10. You may wish to review this section now before proceeding.

Further to the suggestions pertaining to interpersonal skills, two points of consideration are offered as suggestions of how to deal with international students:

1. Informally chat with international students before, after, or during the laboratory (as appropriate) to help them feel more at ease (see section 5.1, page 16). It is important that these students do not feel pressured to participate. Encourage them to speak with you about special concerns.
2. Remember that international students may have English as a second language, so try to speak clearly, audibly, and at a reasonable pace.

If appropriate, you may choose to inform international students about the supports that are available to them:

1. Learning Commons, located on the 1st floor of McLaughlin Library. You can reach Learning Commons at ext. 3632 or *via* email at [learning@uoguelph.ca](mailto:learning@uoguelph.ca) or [writing@uoguelph.ca](mailto:writing@uoguelph.ca).
2. International Student Advisor. Contact Benny Quay at ext. 3954 or *via* email at [bquay@uoguelph.ca](mailto:bquay@uoguelph.ca).
3. Centre for International Students, located on the 2nd floor of Day Hall.

## 4 Your First Chemistry Laboratory as a TA

### 4.1 So Now *You* Are the Teacher. Are You Ready?

A good student must *know* a great deal about his or her discipline. A good teacher must be able to *teach* what they know. You should prepare yourself thoroughly for each lecture so that you can deliver the information that is vital to the successful completion of that laboratory without prompting from the students. It is always an excellent idea to write out your talk beforehand, in either complete sentences or in point form. Attending the laboratory of a more experienced TA as an observer is also advised.

If you are finding any aspect of being a TA difficult you are encouraged to contact a fellow TA, your laboratory coordinator, or professor in charge of the course rather than “suffer in silence.” Confidential advice may also be obtained

from Counselling Services, located on the 3rd floor of the University Centre, ext. 3244.

## 4.2 Delivering an Effective Pre-Laboratory Lecture

The Mission Statement of the University of Guelph states that it “. . . is a research-intensive, learner centred university.” One description of learner centredness can be found in the words of Emerson [4]:

It is a low benefit to give me something; it is a high benefit to enable me to do somewhat of myself.

An effective pre-laboratory talk should serve as an introduction to the experiment at hand. A good introduction will accomplish three goals:

1. It will motivate the students to perform the experiment (or indicate why the experiment is important).
2. It will share your specific expectations as they pertain to safety, accuracy, precision, *etc.*.
3. It will introduce new concepts, phenomena and terminology.

An effective pre-laboratory talk is *not* a discussion of the entire experimental procedure—this material is covered in the laboratory manual. It is unfair to those students which have prepared for the laboratory for you to waste their time. However, as it is possible that the laboratory manual may have been unclear you *may* wish to show up early so that pertinent questions can be answered and the laboratory can start on time.

## 4.3 Handling Questions and Problem Labs

The key to successfully handling questions and problem labs is to be prepared. In addition to the “Questions? Questions?? Questions???” section<sup>16</sup> of the TA Handbook [1], the following list the five common types of questions encountered in the chemistry laboratory may be of use:

1. “I can’t get the right answer.”

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<sup>16</sup> Available at <http://www.tss.uoguelph.ca/tahb/tah4d.html>.

- Typically this is a calculation-based problem. You should ask the student how they went about attempting to solve the problem and listen patiently. Often they are only missing some small piece of the puzzle. If you go about solving a problem for the student in a manner that they are not used to you may end up confusing them. Help them to reach their own conclusions.
2. “I don’t understand [the concept of]...”
    - Typically, this question refers to concepts such as buffer calculations, *etc.*
    - Avoid teaching something *de novo*. Ask the student to show you what they have done thus far and answer their specific questions. You are not under any obligation to help if the student has not made a reasonable effort to learn the concept on their own.
  3. “Does this look right?”
    - Typically the student is holding up a test tube or vial for your inspection.
    - If you can answer this question you may choose to do so. However, do not feel pressured to give an answer. Ask the student what they have done thus far. If they cannot describe precisely what stage of the experiment they are at and how they got there, suggest that this information is vital for you to know. Let them go back to the laboratory manual and determine what they have done thus far.
    - Help the students develop critical thinking skills: ask them what they expect to see and why.
  4. “I don’t understand the part in the manual where...”
    - This type of question typically refers to experimental procedure. Answer it as clearly as possible.
  5. “If a dog is an animal and a cat is an animal, then a dog is a cat, right?”
    - The error in logic will rarely be this glaring.
    - Do not feel pressured into giving an instant answer—you are not being paid to give fast answers, but to give correct answers.
    - Listen to the students and ask them to break down their explanation. Go through it methodically. Your students may learn something of why good researchers must be careful and methodical.

## 5 Your First Three Labs: A Practical Outline

### 5.1 Week 1: Your First Impression

Set the attitude of your laboratory immediately. If wish to run the laboratory in an informal manner, arrive early to the laboratory and get to know the students. If you wish to have a more formal style, arrive just before laboratory begins. Either way, ensure that the students feel that they have access to your input through email, office hours (if appropriate), *etc.*.

Be sure that your first laboratory talk is very well polished as first impressions are hard to change. Below is a suggested outline for the first week of a first year undergraduate chemistry laboratory. In addition to the following outline, you may wish to consult the “Starting Off on the Right Foot”<sup>17</sup> section of the TA Survival Guide [2]

1. Present an Outline of the Laboratory Period.
2. Introduce Yourself:
  - Give your name, what you are studying, and why.
  - Share some of your teaching philosophy (see section 1.2, page 4) with your students.
  - Try to inspire a love of knowledge in them (see section 2.2, page 8).
3. Breaking the Ice:
  - If you wish to have a more informal atmosphere you might want to encourage the students to stand up, indicate the following:
    - (a) their name
    - (b) where they are from
    - (c) what their favourite chemical is and why
4. Establish a “Safe” Classroom:
  - Stress that there are no “stupid” questions.
  - Review the traits of a successful student (see section 2.1, page 7).
5. Tell Your Class What They Can Expect of You:
  - Review “Tips on How to be a Successful Teacher”, section 2.4, page 9.

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<sup>17</sup>Available at <http://www.tss.uoguelph.ca/tasg/tas1title.html>.

6. Tell Your Class What You Expect of Them:
  - Stress preparedness for the laboratory and whatever else you deem to be important:
    - University students are expected to be prepared for their labs.
    - Pre-laboratory talks (given by the TA) typically deal with only some of the salient points of the experimental procedure.
    - Going over the entire experiment is unfair to those who have prepared for the lab.
7. Elect Two Ombudspeople (see section 2.3, page 9).
8. Marks:
  - Give the class a clear outline on how they will be evaluated in the laboratory.
  - Ensure that the course organization and requirements are clear to students [1].
9. Familiarize the class (and yourself) with the location of the following items:
  - (a) The nearest telephone:
    - The emergency phone number on the U of G campus is extension 2000.
  - (b) The nearest first aid kit:
    - If you are a qualified in first-aid or CPR, identify yourself as such.
    - Ask your class if any of them are qualified in first-aid or CPR.
  - (c) Eye Wash:
    - Demonstrate its use.
  - (d) Shower Location:
    - Sure, it is cold and embarrassing, but the alternative (wound or disfigurement) is worse.
  - (e) Fire Blanket Location:
    - Be sure to keep flames away from a person's face.
  - (f) Fire Extinguisher Location:
    - *NEVER* allow a fire to get between you and your escape route!
  - (g) Emergency Pull Station Locations:

- Use the yellow boxes on the U of G campus.
10. Familiarize the class (and yourself) with the following safety concerns:
- (a) Report All Injuries:
    - It does not matter how minor the injury is.
    - Find and complete the requisite forms.
  - (b) Attire:
    - Safety goggles are to be worn *all* the time when experiments are in progress in the lab:
      - There is no room for negotiation on this matter. Remove the student from the laboratory if they are not compliant.
    - Do not wear sandals or tank tops.
    - Shorts and skirts must extend to the knee.
    - Long hair must be tied back.
    - Watches and jewelry should be removed:
      - Chemicals may be trapped against the skin.
  - (c) Acids and Bases:
    - Acid burns often begin by feeling itchy—if in doubt, *wash*.
    - Bases feel slippery—if in doubt, *wash*.
  - (d) Extinguishing Fires:
    - *NEVER* allow a fire to get between you and your escape route!
  - (e) Cleanup:
    - Never leave a work area dirty as acids and bases are virtually indistinguishable from spilled water:
      - There is no room for negotiation on this matter. Deduct marks from the student’s lab.

## 5.2 Week 2: Managing the First Experiment

Be sure to deal with the difficult parts of the experiment, but do not discuss the entire experimental procedure as this is unfair to those students that have prepared for the lab. You may wish to review section 4.2: “Delivering an Effective Pre-Laboratory Lecture” on page 14.

### 5.3 Week 3+: Handing Back the First Graded Laboratory Report

Many of your students will be shocked with their grade when you return their first graded laboratory report. Students that were used to receiving 80's and 90's are usually unhappy with 60's and 70's. Prior to returning the first graded laboratory reports, it may be helpful to review the "First-Year Students"<sup>18</sup> section of the TA Handbook [1] and make the following announcements:

1. Recognize that some members of your laboratory may want to join professional programs and that good marks are necessary to do so.
2. As the TA, you have no personal interest in seeing your students receive low marks. However, you are not at liberty to deviate from the marking scheme which applies to all the students in the class.
3. State your willingness to review the marking of any laboratory report in the presence of the student to see that the marking is consistent with the grading key.
  - Review the grading scheme beforehand and be prepared to explain and justify the deductions prescribed within it.
4. The members of your class are there because they are among the brightest students from their respective high schools. For the most part those students that "rounded out the bottom of the mark curve" did not go on to university. The competition just got tougher.

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<sup>18</sup>Available at <http://www.tss.uoguelph.ca/tahb/tah2b.html>.

## References

- [1] Christensen Hughes, J.; Hendry, J., Eds.; *TA Handbook 1998–99*; Teaching Support Services: University of Guelph, Guelph, ON, Canada, 1998 This publication is available via the world-wide web at <http://www.tss.uoguelph.ca/tahb/tahindex.html>.
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