

Introduction to “Logical Thinking Skills for Academic Writing”

講習会 “Logical Thinking Skills for Academic Writing” の紹介

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Abstract

“Logical Thinking Skills for Academic Writing” is the name of an annual workshop series that has been conducted at the central library of Nagoya University since 2014. It also represents a new construction approach to the education of logical thinking for academic writing, which primarily focuses on how a logical argument can be actually constructed for an argumentative paper from scratch.* The aim of this paper is to introduce the new construction approach through three main topics covered by the workshops. The first is to explain why a logical argument is needed for research writings such as a graduate dissertation, and point out where exactly the argument is needed in a dissertation. The second is to show how to build a primitive research claim for a dissertation, and turn it into the basis of the clarity and originality of the research paper. The third is to highlight how to practically build the premise to prove the claim, and hint how the premise and claim can be developed into a full-blown logical argument.

Keywords

Logical thinking, argument, academic writing, dissertation, research writing, clarity, convincingness.

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1. Why it is important to think logically for academic writing

1.1. Variations and commonality in academic writing

The world of academic writing is of immense variations. There are many different kinds of academic writing. For example, there are dissertations, journal papers, conference proceedings, reports, scholarship or grant applications, and many more. These writings are produced by different academic disciplines such as agricultural sciences, biology, chemistry, engineering, humanities, medical sciences, psychology, etc. The writings can be written in different languages, including English, French, German, Japanese, Chinese, etc. And on top of all those major variations, there are differences in formats and styles.

But despite the variations, many academic writings, especially research writings, share one common feature. The commonality is clearly visible if we compare them with novels. The two writing genres differ fundamentally in their primary communicative purposes. The primary goal of writing a novel is to entertain its readers. To make the writing entertaining, a novel writer should be able to, among other things, provide vivid and evocative descriptions of some story characters and plot in a way that would enable the readers of the novel to feel as if they were actually seeing and feeling the characters and things being described. But the goal of writing a research paper such as a dissertation is not to entertain. It is to explain an original research discovery, which is presented in the form of a research claim. And the ultimate goal of providing such an explanation is to convince the readers of the paper to accept the claim by reference to the premises that can infer the truth of the claim. In short, what is important for the academic writing is to have a logical argument that is composed of a research claim and the supporting premises.

1.2. The importance of logical thinking in academic writing

The importance of logical thinking in academic writing can be easily shown by seeing what a writing process involves. Like every other genre, academic writing is a complex process that is basically developed based on making various sorts of text connections to form words, sentences, paragraphs and beyond. For example, forming an English word such as “dog” is to connect the three alphabets, “d”, “o”, “g”, together. Forming an English sentence such as “there is a dog.” is to connect the words, “there”, “is”, “a”, “dog”, and the punctuation, “.”, together. For the formation of a word or sentence, there are well-defined orthography and grammar rules that govern and regulate the correct text connections. But such linguistic rules are rather limited. They would not be able to rule the connections like the following one: “There is a dog because the moon is made of green cheese.” The spelling, punctuation and grammar in the example are all correct. But the connection between the two sentences is unintelligible.

For the text formation that goes beyond a sentence-level, we would need a different set of rules. Consider the connection among the following three sentences:

- (1) Every dog barks.
- (2) LUCKY is a dog.
- (3) LUCKY barks.

The connection here is governed by the validity rules in logic. The three sentences are validly or logically connected in the sense that if both (1) and (2) are true, then they would infer the truth of (3). Technically speaking, (1) and (2) are regarded as the premises for inferring (3), which is the conclusion. Combined together, the premises and conclusion form a logical argument.

Obviously, not every sentence in academic writing needs to be logically connected to another. Sentences that are grouped together to form a description about a research method, historical background, and so on do not need to exhibit an argument as long as the description is coherent and intelligible to the readers. But when sentences are used to form an explanation about a new discovery, which typically involves providing reasons for accepting a claim or hypothesis, then the connection between the reasons and claim would most certainly need to be logical in order to convince the readers to accept the claim.

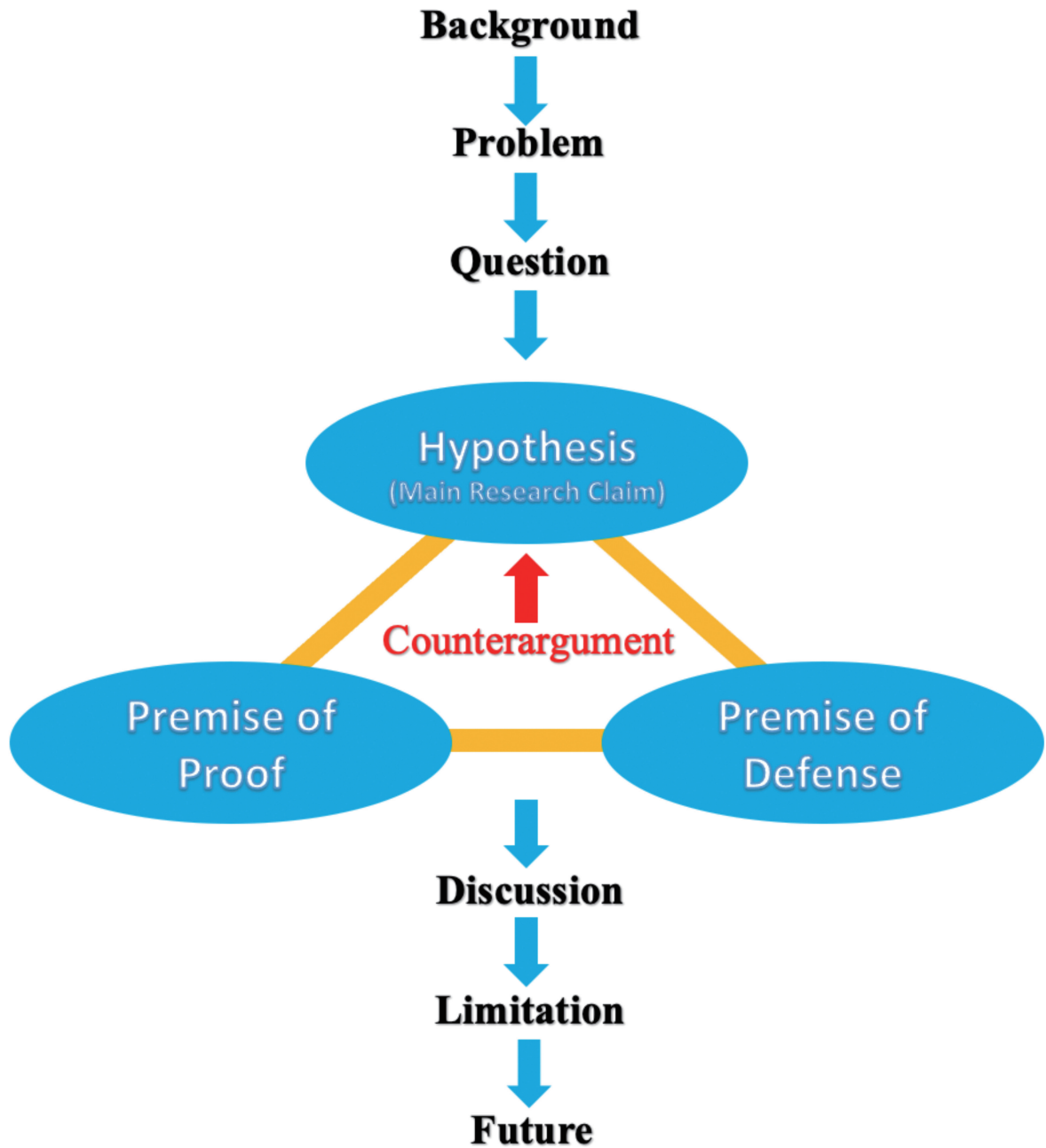
1.3. The common components that form a graduate dissertation

Let us use a specific case to further demonstrate the importance of logical thinking in academic writing. Consider how a graduate dissertation is formed.

Every university student is required to successfully complete a dissertation in order to graduate. Although different academic disciplines may require a dissertation to be written in different formats and styles, almost all of them would require it to contain, in one way or another, the components illustrated in the Research Writing Diagram. As I shall explain below, the core of the components in the diagram, which are connected together via a triangle shape, is a logical argument.

The Research Writing Diagram

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1.3.1. Background

If you are a Doctoral student, then you would know that the most important thing to present in a dissertation, besides showing that you have mastered the necessary knowledge in your research field, is to show that you have accomplished some original research. As far as the research originality is concerned, one of the most important things to show is how your research differs from the previous research in the same field. But before you can do that, you need to first provide the background that led to your research, specifying the research that was carried out before yours.

1.3.2. Problem

Merely introducing the previous studies in your research background is not enough. They would mean nothing to your research unless there is a relation linking the two. That is, although it is important to understand what the previous research has accomplished in the research field, it is necessary to explain how it could be further improved or developed. If the previous research was already perfect, what would be the point to carry out your research? Thus, the problem of the previous research is the justification for your research. It is the bridge that connects the previous research to your research.

1.3.3. Question

Asking the right question is indispensable to conducting effective and meaningful research. Research is by nature an inquiry, aiming to make some new discovery through a quest for some specific information that answers a specific question. The kind of information to be rewarded is ultimately determined by the question being asked. For example, why you are writing a research paper and how you are writing the paper are pointing to completely different directions of answering the questions; one points to the reason for writing the paper whereas the other points to the method used to do it.

1.3.4. Hypothesis or Claim

Arguably, the term “hypothesis” may be exclusively used in disciplines of empirical sciences. For humanities and other disciplines that do not rely on empirical methods to conduct research, they may prefer to use a different term, such as “claim” or “main point”. But whether it is called “hypothesis” or “claim”, the term represents a hypothetical answer to a research question. It encapsulates the originality of one’s research and functions as the basis for developing the research. This is the most crucial part of a graduate dissertation, and where logical thinking skills are mostly needed. The claim needs to be explained and argued for. Section 2 and 3 below are specifically allocated to highlight how the clarity and convincingness of a dissertation are determined by the dissertation’s central claim.

1.3.5. Premise of Proof

Although an original research claim is the heart of a dissertation, it would be powerless if it is not convincing. For example, I could make a claim that one day would have 36 hours after 1 billion years later. But if I cannot present credible evidence to prove it, then no one would take my claim seriously. Thus, providing the proof for a claim is as important as having the claim. This is also the first major part of building the logical support for a claim. In order for something to be the proof for a claim, there should be an appropriate inferential relation linking the two; i.e. the truth of the premise of proof would reasonably infer the truth of the claim. Accordingly, in order to build the premise of proof, one would have to be able to identify the inferential or logical relation, and use it as a guide for the premise construction.

1.3.6. Counterargument

As far as scientific research is concerned, no hypothesis can be proven 100% true. No matter how credible the supporting evidence is, it cannot generate an absolute conclusion. There is always the possibility for a claim to be false. Such a possibility represents the counterargument to a claim. Thus, only providing the proof for a claim is not enough. There is also the need to anticipate the possibility for a claim to be false. As I will explain in details elsewhere, a counterargument is a form of disagreement. But a disagreement is not necessarily a counterargument. Knowing what counts as the counterargument to a claim is not fundamentally different from knowing what counts as the proof for the claim. They all derive from the same logical basis.

1.3.7. Premise of Defense

Since there is always the possibility for a research claim to be false. Knowing how to defend a claim against its counterargument is as important as finding the evidence to prove it. In fact, knowing how to build a premise of defense may prove more useful in the process of building a logical argument, because it is always more difficult to find the ‘smoking-gun’ evidence for a claim. Compared to building a premise of proof, building a premise of defense would require one to have a higher level of logical thinking skills. It requires one to know how to anticipate a counterargument, and then how to establish the proof that counters the counterargument. The logical support for a claim would be complete if both the premise of proof and premise of defense for the claim are properly constructed.

1.3.8. Other components – Discussion, Limitation, Future

Once you have completed proving and defending your research claim, you are at the stage of finalizing your dissertation. Depending on the requirements of your academic discipline, here you may have to provide a Discussion for the final conclusion of your research based on the results collected and assembled for the premise of proof and premise of defense. For example, if the conclusion significantly differs from the original hypothesis, then you would have to explain the difference and how the change was made from the hypothesis to the conclusion. The discussion may be connected to the Limitation of your present research. All researches are conducted within a limited period of time, and as a result, all researches have limitations in one way or another. Specifying the limitations of your present research would pave the way for the next step in the Future.

2. How to make your writing clear

2.1. The basis of the clarity

In the last section, I have introduced the importance of logical thinking skills in academic writings by highlighting the features and components that are commonly shared by research writings such as a graduate dissertation. Among the common components that form a graduate dissertation, the core is the construction of a logical argument that is composed of a main research claim and two kinds of premises needed to support the claim. The basis of the argument construction is the research claim. Since the argument forms the core of a dissertation, the clarity of the research claim determines the clarity of the entire paper. To shed some light on this important point, let us consider how you would begin the research for a dissertation.

According to the Research Writing Diagram presented in the last section, the first component in the research writing process is the Background. This would be an inevitable way to begin a research process if you do not have much information about the research that you are undertaking. By finding out the previous studies that have been carried out in your research field, you would acquire some important background knowledge. However, unless you could form a preliminary idea about your own research at the same time, you would not know what the background knowledge is for. In fact, acquiring the background knowledge aimlessly would increase the confusion about your research. You would have no basis to judge which background knowledge is relevant and which is not. As a result, you might end up spending a superfluous amount of time in studying other people’s works.

To effectively develop the clarity about your own research, it would be better to form a preliminary idea about the research at the earliest stage possible, and use it as the basis to illuminate and guide the entire research and writing process. Let me explain this point with a concrete example.

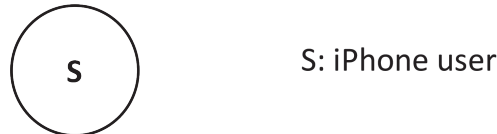
2.2. The iPhones example

Imagine that you and I are going to write a dissertation about iPhones. And assume that the research on iPhones is an unfamiliar territory to both of us. It is therefore natural to begin the research by reading some available studies concerning the topic. But there are many different kinds of information about iPhones, including the phone models, functions, marketing, and many more. It would be difficult for us to proceed to a deeper level of research without a specific direction. Thus, after some initial rounds of web surfing and documents skimming, one important task that needs to be accomplished as soon as possible is to establish a research focus.

2.2.1. Establish a research focus

A research focus can be about almost anything. However, the primary purpose of establishing a research focus is to narrow down a vast research scope to something that can be realistically investigated within a designated period of time. Thus, when deciding

whether a research focus is appropriate, there are two major criteria to consider. First, a research focus should be combinable with other essential elements to form a realistic research claim. As it will become clearer later, a research focus is the subject (S) of the main research claim of a research paper, and all the other elements of the claim will help to determine if S is appropriate. Second, if the research claim is properly established, it should be able to generate an implementable research plan for the data collection and so on. This point will be explained in section 3. For the purpose of providing a simpler illustration, let us choose the noun phrase, “iPhone user”, as our research focus. It would allow us to significantly narrow down the vast research scope about iPhones to the study of a specific group of people in the real world.

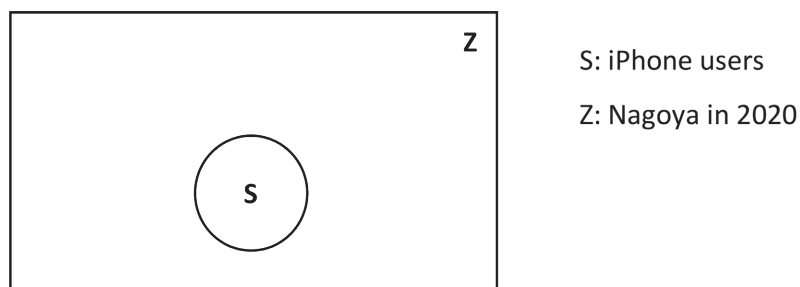


Step 1: Establish S.

2.2.2. Define a research boundary

Having chosen a research focus, the next important step of the research clarification is to define a realistic boundary for the research. Without a realistic research boundary, it would be difficult for the research to be accomplished within a designated period of time. For example, although “iPhone user” refers to a specific group of people, there are many people in the world that are legitimate members of this group. It would be impossible to include all of them in the study. In addition to making a research accomplishable, another major purpose of defining a research boundary is to clearly define the circumstances in which a research claim is true. This step is crucial when it comes to building the logical support for the claim. Without a clear boundary, it would be impossible to know when a claim is true and when it is not.

For our present example, let us limit the legitimate iPhone users for the research to “iPhone user in Nagoya in 2020”. It would allow us to further narrow down the research scope to a specific group of iPhone users at a specific location in a specific time. The symbol that represents the boundary of a research claim is Z .

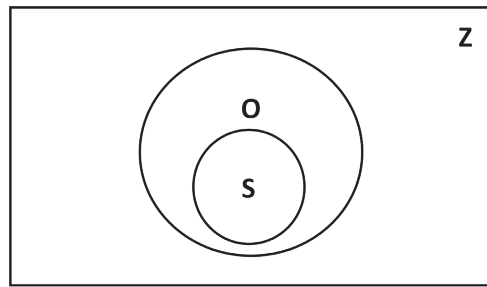


Step 2: Define Z.

2.2.3. Establish a specific perspective

Having define a realistic boundary for the study of S , the next step of the clarification process is to link S to a specific object (O) so that a specific perspective can be provided for the research focus. Note that the ‘object’ here should be broadly understood as something to which S bears a relation. Thus, it does not have to be a material object that can be seen or touched. The primary purpose of establishing O is to turn S into a logical statement (i.e. a research claim) that can be either true or false. For example, the study regarding the iPhone users (in Nagoya in 2020) would not yield any meaningful result because the iPhone users, taken in isolation, cannot be proven to be either true or false. But when the subject of the research is investigated in relation to some particular object, such as Mac user – e.g. *Every iPhone user is a Mac user*, then it would become a logical statement that is provable to be either true or false.

For convenience, let us just use the noun phrase, “Mac user”, as the object that the iPhone users bear a relation to.



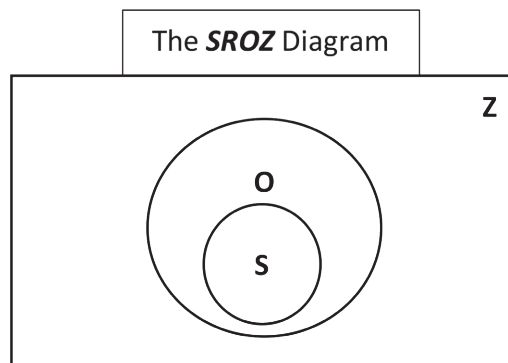
S: iPhone user
 Z: Nagoya in 2020
 O: Mac user

Step 3: Establish O.

2.2.4. Connect the elements together

The final step in the current stage of the clarification process is to elucidate the relation (R) that links S to O in Z . As far as scientific research is concerned, this is also the most crucial and difficult part. R is the most crucial element because, as I mentioned above, it is by means of the relation to O that S can be properly investigated. R is also the most difficult element to understand because the exact nature of the relation between S and O might not be clearly visible until the end of the research. But whatever R turns out to be exactly, there are only three possible ways for R to take place between S and O . They are: (1) S is *fully related* to O in Z . (2) S is *partially related* to O in Z . (3) S is *fully unrelated* to O in Z . However, regardless of whether S and O are actually related in the reality, when making a claim that S is related to O in Z , unless there is already some good reason to cast doubt on the relation before testing the claim, it would be natural to expect that S is fully related to O ; i.e. the occurrence or presence of S is expected to be followed by the occurrence or presence of O . For this reason, it would be natural to allocate S to the smaller circle that lies within O . It is only in virtue of such an arrangement that S is fully related to O ; i.e. every (part of) S is related to O .

For the present example, let us assume that the relation between S and O is a correlation, and express it using a copula, "is". Note that the relation is not directly visible. It can only be indicated through the arrangement between S and O in the $SROZ$ diagram.



S: iPhone user
 Z: Nagoya in 2020
 O: Mac user
 R: is (correlation)

Step 4: Connect the elements together.

2.3. A preliminary research claim and the SROZ elements

By putting all the $SROZ$ elements together, we have built a preliminary research claim. It would be fine if the contents of the elements are still very rough. They are modifiable throughout the entire research and writing process, whenever there is a new finding or development that challenges the claim. But even as a preliminary claim, it already gives us the clarity that is needed to kick off an effective investigation. We can use it as an invisible component to guide the research process from the beginning. Through the research focus (S) within a specific boundary (Z), we can already know what previous studies are relevant to the present one. And based on the relation between S and O , we have the matrix to scrutinize those studies and find the gap that can clearly distinguish our study from them. Once the gap is properly acknowledged, the invisible claim can be transformed into a visible one – a fullyfledged claim of the paper. The claim will then be used to guide the subsequent research process, particularly the process of collecting the data that are needed to build the supporting premises for the claim. If the premises that can prove and

defend the claim are properly established, then the claim would be turned into a confirmed conclusion, otherwise it would have to be modified or even abandoned.

But no matter how the contents of the **SROZ** elements might change, and regardless of whether the claim is preliminary or confirmed, the distinctive roles of the four elements in a research claim would remain the same throughout. The clarity of a research paper ultimately depends on having a clear understanding of what the essential elements are respectively, and how they can be combined together to form a novel and provable claim.

3. How to make your writing convincing

3.1. *The basis of the convincingness*

I have introduced the basis of the clarity of a research paper, which is a clear understanding of the essential elements that constitute the paper. They are the research focus, a specific perspective in which the research focus is studied, a specific relation that connects the focus to the perspective, and the boundary within which the research is carried out. Once the four elements are properly combined together, they form the main claim of a research paper, and become the claim's subject (**S**), object (**O**), relation (**R**), circumstances (**Z**) respectively. Through the iPhones example, I have demonstrated how a preliminary research claim is built from the **SROZ** elements. Hopefully you can also see how such a development illuminates the preparatory process for the research on iPhones.

The next major stage in the research writing process is to build the premises for the main claim of a research paper. If they support the claim convincingly, then a logical argument for the paper would be constructed. This is the most critical stage of making a research paper satisfactory. But it is also the most difficult. We cannot get much help from both traditional and contemporary studies of logic, which basically focus on the assessment of an argument. A primary condition for conducting an argument assessment is that a group of statements including premises and conclusion already exist. Then the validity principles or other welldefined rules of logic can be used to evaluate if the inference from the premises to conclusion is logically valid. However, such an assessment would be useless if the group of statements is absent.

Construction of an argument takes place at a much earlier stage than assessment. Usually in the early stage of writing an argumentative paper, the argument of the paper is completely absent. The paper's writer would have to construct almost everything from scratch. Furthermore, during the construction of an argument, a different kind of logical thinking skills is needed. If the writer begins the construction process with a preliminary research claim, then he or she would have to know what premises are needed for the claim, and how they can be constructed. The logical thinking skills that connect a hypothetical conclusion to its supporting premises is exactly opposite to the conventional approach of assessing the inference from some premises to a conclusion.

The project of the new construction approach to logical thinking (or construction logic for short) is huge, and cannot be fully covered here. The present introduction only aims to briefly indicate how the construction logic can be practically implemented in academic writing. Let me do it through the iPhones example again.

3.2. *The iPhones example again*

Let us assume that the preliminary research claim we built for the dissertation on iPhones turned out to be a fully-fledged claim of the research paper. The next stage of developing the central claim is to build a *Premise of Proof* (POP), which is one of the two major types of premises that constitute the convincing support for the claim. The role of POP in the argument is to show that there is direct evidence that can substantiate the claim, or prove that the claim is (likely to be) true. For this reason, POP is usually the first type of the premises that needs to be established in the process of constructing the convincing support, unless the direct evidence is not available under some special circumstances. The following are some of the major steps for building POP.

3.2.1. *First Step – Envisage the evidence for the claim*

Before we can actually go out to collect the evidence for the claim, we should be able to envisage the things (or activities) that can be counted as the evidence for the claim. This can be done by carefully examining the four essential elements of the claim, and ask the following question: how could the elements be actually realized in the real world? More specifically, what could be the things by means of which the elements are actually realized in the real world?

The four essential elements of the claim are: (**S**) iPhone user, (**Z**) Nagoya in 2020, (**O**) Mac user, (**R**) correlation. And below is the

list of things by means of which the elements could be actually realized in the real world.

(1) In the real world, the people who qualify for being the “iPhone user” are people who use any of the following devices: iPhone 12 series, iPhone 11 series, iPhone 10 series, iPhone 8 series, iPhone 7 series, iPhone 6 series, iPhone 5 series, iPhone 4 series, iPhone 3 series.

(2) In the real world, the people who qualify for being the “Mac user” are people who use any of the following devices: MacBook series, PowerBook series, iMac series, iBook series, etc.

(3) In the real world, the places which are qualify for being a part of “Nagoya in 2020” are any of the following areas in Nagoya: Nagoya University (including Higashiyama, Daiko, Tsurumai campus), Sakae, Fushimi, etc.

(4) In the real world, the correlation between the iPhone users and Mac users would be realized if an iPhone user in Nagoya in 2020 is connected to being a Mac user as well; i.e. the fact of being an iPhone user in Nagoya in 2020 is actually followed by the fact of being a Mac user. If the relation between the two is proven true, then the claim would be proven true.

3.2.2. *Second Step – Devise an appropriate research method for the data collection*

Having envisaged the evidence for the claim, the next step is to devise an appropriate method that can actually collect the evidence. Generally speaking, whether a research method is appropriate depends on whether the method can lead to the obtainment of the evidence envisaged. Besides the general principle, the appropriateness of the method is specifically determined by three major factors, including (i) what counts as the admissible evidence in the research field, (ii) how long is the research period, (iii) how much funding is available for the research.

For the claim here, there are basically two kinds of method that can be considered. One is to conduct a face-to-face interview with people who live in Nagoya, asking them a set of questions that could lead to the desired information. The other is to send out a questionnaire containing a similar set of questions for the research. The interview would be faster but it might be limited in scope, because of the factors concerning time and space. It might be also costly, assuming that some sort of rewards might have to be provided in order to trade for the information. The questionnaire, if it is sent via an email, would be cheaper and it could target a wide range of people. But it might take some time for the responses to come back.

3.2.3. *Data collection*

Having had an appropriate method devised, then the data collection process can take place. Depending on the method, it may take some time for the data to become available. During the process, you might have to constantly polish the thesis statement and refine the method accordingly.

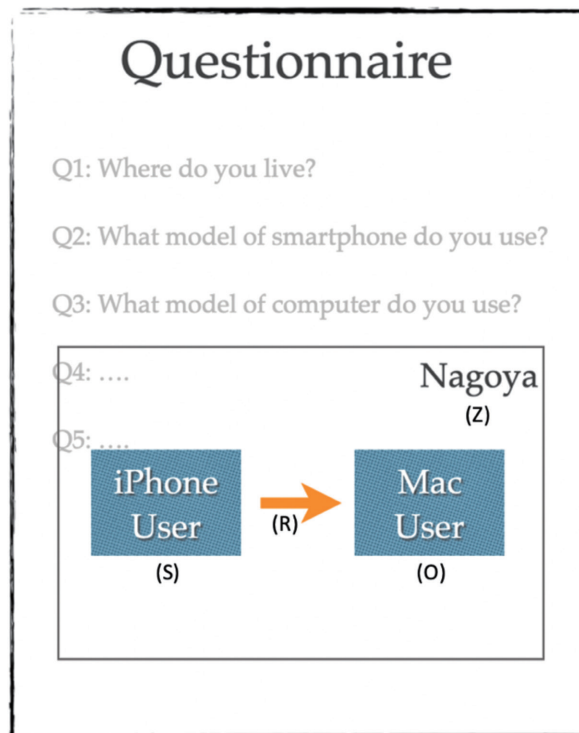
3.2.4. *Third Step – Assemble the evidence*

Once the data collected for the claim become available, the actual construction of POP can finally take place. The most important part of this process is to show that there is evidence that proves that a claim is in fact true, or evidence that shows that **S** is in fact **Related to O** in **Z**. Ideally speaking, a claim would be true if it corresponds to some particular facts in the real world. But facts, qua facts, cannot be incorporated into research, and therefore there must be something that can represent the facts in research. Such a representation is the evidence for the claim.

As a representation of some particular facts, evidence can be manifested in many different forms. For example, a photo, a video, an audio recording can all be used as evidence because they capture some moments or events that actually took place in the real world. Similarly, a testimony that provides an accurate description of some real experience, an expert who can provide reliable information about some rare phenomenon that occurred in the past, a DNA sample that carries information about a particular individual, and anything else that reliably indicates the facts can all be used as evidence. In addition to the variations in forms, evidence can be either a singular piece or multiple pieces, as long as it represents the facts that can prove a claim as a whole; i.e. **S** is **Related to O** in **Z**.

Regarding the claim in this case study, the claim would be true if it is a fact that in 2020 every iPhone user in Nagoya is a Mac user. The evidence for the claim can be obtained from the questionnaires filled out by a group of people selected for the research. Each of the questionnaires represents a person, and the answers given in it represent what the person is in regard to the use of the phone and the computer. It would be counted as the evidence for the claim if the questionnaire contains the information that fulfills

the condition illustrated below.



The Evidence Condition

Suppose that the analysis of the collected data yields the following results:

Sato who lives in Sakae, is an iPhone X user and an iMac user.
Kato who lives in Ozone, is an iPhone 7 user and a MacBook user.
Tanaka who lives in Nagoya, is an iPhone 4 user and iBook user.
 ...

All the results shown are inferentially relevant to the claim because they are the actual instantiations of the things denoted by the claim. iPhone X, iPhone 7, iPhone 4 are actual instantiations of "iPhone" in the real world. iMac, MacBook, iBook are actual instantiations of "Mac". "Sakae", "Ozone", "Nagoya" are real areas in Nagoya. Sato (who is both an iPhone X and iMac user), Kato (who is both an iPhone 7 and MacBook user), Tanaka (who is both an iPhone 4 and iBook user) are actual instantiations of "iPhone users" and "Mac users" in the actual areas of "Nagoya". Although the facts obtained are not enough to confirm the claim, they help to increase the probability for the claim to be true. Thus, they are the legitimate evidence that constitute the proof.

3.3. Other steps

There are many other steps that are necessary for the construction of the logical/convincing support for a research claim. They include the step to test the reliability of the relation, R (between S and O in Z), the step to anticipate the breakdown of R and hence the falsity of the claim, and the whole list of steps in POD (Premise of Defense) to defend the claim against the counterargument. But all of them are designed based on the same guiding principle; i.e. S is Related to O in Z . If the evidence is not sufficient enough to prove that S is reliably related to O in Z , or the counterargument (i.e. S is not Related to O in Z) cannot be refuted, then either the truth of the claim can only be accepted as a probability, or the entire claim would have to be abandoned.

4. Conclusion and beyond

Through the three main topics covered, this paper has briefly introduced why a logical argument is needed in an academic paper such as a graduate dissertation, shown how a preliminary research claim can be built for the research writing, and hinted how a logical argument can be developed based on the claim. Hopefully you can see how logical thinking skills can be practically applied to academic writing, and get the basic idea of how a logical argument can be constructed from scratch.

Although the paper tries to cover as much as possible, many important features of the construction logic are not included in this introduction.

One of the main features is the step-by-step guidance entailed by the construction logic. The recipe approach to teaching logical thinking is an indispensable part of the construction logic. Each of the components illustrated in the Research Writing Diagram is equipped with a comprehensive set of instruction steps that are designed to help students collect the essential information that needs to be presented in the respective section. Those recipes are available for full-time students who take the courses, Research Skills A-1 and Research Skills A-2. The combination of the A1 and A2 course offers a one-year training that specifically focuses on the logical thinking skills for writing a graduate dissertation. Through the comprehensive recipes provided by the courses, students would learn how to build a central research claim for his or her dissertation, develop the claim into a full-blown argument, write the dissertation's abstract, introduction and so on. All graduate students are recommended to take the important training.

Another is the applicability of the construction logic to other general academic skills that are necessary for all university students. If the construction logic can be applied to academic writing, then it can be also applied to presentation, leadership training, teambuilding, and other academic skills that emphasize on explanations, creating new ideas, and providing the logical support for the ideas. At Nagoya University, an intensive course known as the "Summer Camp" has been created to cover all the necessary academic skills including academic writing, presentation, research ethics, team-building, leadership. All these skills are linked together through the logical thinking skills training. In addition to the diversity, students can learn the thinking skills as a team. Throughout the four-day camp, each student will work with three or four group members to create some exciting ideas to compete with other groups. In this creative and competitive environment, students would have to learn together and support each other as a team. Naturally, they would become more creative and confident in their thinking skills. All undergraduate and graduate students are welcome to take part in the comprehensive and exciting learning experience.

Reference

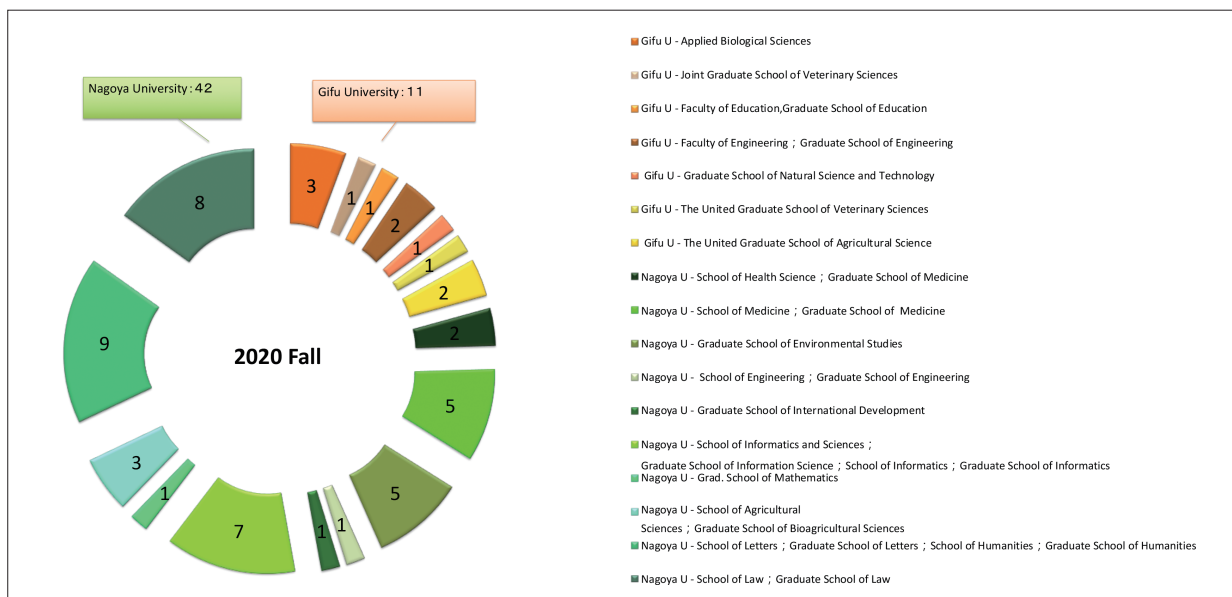
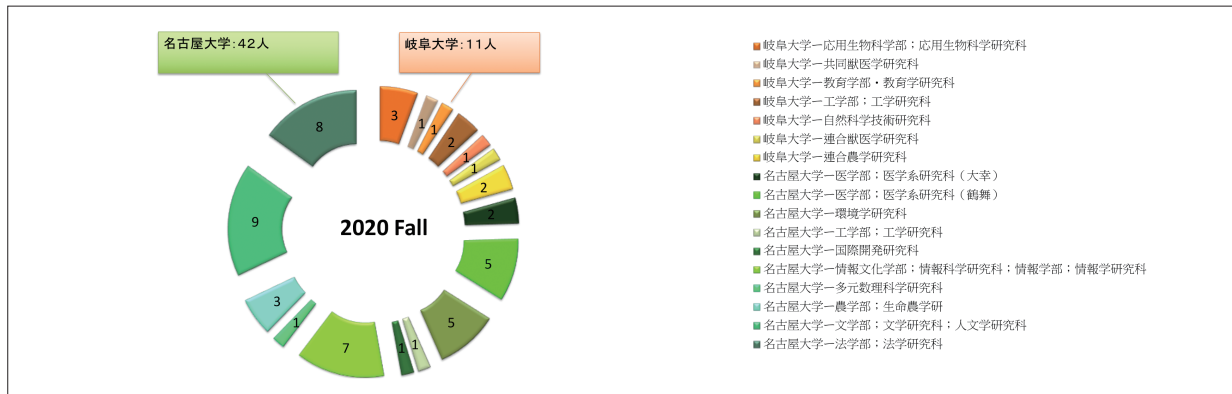
Lai W. L. *Start from a simple sentence: The construction logic for building a clear and convincing research paper*. Unpublished.

[†] I am grateful to KIKUCHI Masashi and ZHANG Lin for their hard work on assembling all the data together for this report.

Appendix – Report of the previous workshops[†]

According to the library registration record, a total of 429 participants have registered for the workshops in the past. The following charts provide a breakdown of the participants and their affiliations.

(1) Information regarding the participants and academic disciplines (2020 Fall)



(2) Information regarding the participants and academic disciplines (2014 – 2020 Spring)

	2014	2015	2016	2017	2018	2019	2020前期	2020後期
Graduate student	6	28	34	25	31	20	35	42
Undergraduate student	17	10	29	15	9	8	10	4
Researcher student	1	0	2	0	2	0	0	7
Graduate (卒業生)	1	0	1	0	0	0	0	0
Credited Auditor	0	0	1	0	0	0	0	0
Audit student	0	0	0	1	0	0	1	0
Faculty member	0	0	0	0	0	0	5	0
Staff member	0	0	0	0	0	0	3	0
Other	0	8	4	5	3	7	0	0
Total	25	46	71	46	45	35	54	53

