Theoretical Article https://doi.org/10.12973/ijem.10.4.629

International Journal of Educational Methodology
Volume 10, Issue 4, 629 - 643.
ISSN: 2469-9632
https://www.ijem.com/

Living the Viva: The Oral Examination in Practice

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Received: Received: July 3, 2024 ▪ Revised: August 3, 2024 ▪ Accepted: October 15, 2024

Abstract: The viva examination or 'defence' is a pivotal moment in a student's or researcher's career. It marks the conclusion of one stage and the beginning of another, whether during the study period or when competing for research funding. Unlike many other formal assessments, the viva is an oral performance. Its form may strongly depend on the domain of science or knowledge sector, on the university or even on faculty. The rituals of interaction between jurors and candidates may differ in many cultural contexts. Yet, the core elements of the defence are the debate, the use of evidence, and the justification for a statement or opinion delivered orally, are common to all. Accordingly, although a successful defence is about content, it is also about language and attitude. In academic education, there is insufficient preparation for this moment when one is in front of jurors, a commission, and even a wider audience. We draw on our combined experience in our own careers and in their coaching of students to present an analysis of the 'viva' process. Our findings may help candidates position themselves in the viva context and offer practical advice on how to prepare, define an attitude, and structure answers and responses in general.

Keywords: *Examination commission, jury, public defence, scientific argument, thesis.*

To cite this article: McNeill, J., Benitez-Capistros, F., Dahdouh-Guebas, F., Deboelpaep, E., Hugé, J., Mukherjee, N., Van der Stocken, T., Van Puyvelde, K., & Koedam, N. (2024). Living the Viva: The Oral Examination in Practice. *International Journal of Educational Methodology*, *10*(4), 629-643. https://doi.org/10.12973/ijem.10.4.629

Introduction

"I have never felt so nervous in my life before", recalled Gabi.† Rosa "fluctuated from OK to not panicking to panicky and back again", while Alec found the whole experience "intense, very special, civil, but also dangerous, and almost existential". The three in separate interviews were reflecting on their recent oral defences of their doctoral theses – the viva voce or viva. All were excellent students. All knew that their doctorates were secure before they entered the examination room. Each had seen their examiners' reports in advance of their defences; one of Alec's began, 'this is an excellent thesis…', and Rosa had already published two papers in high-ranking journals with a third accepted for publication. It seems puzzling then that their vivas proved so visceral. And it may seem perhaps quaint that such a trial

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† All witness accounts are based on true cases but names have been changed to respect individuals' identities.

by ordeal, a test in endurance with candidates seemingly relying as much on stamina and adrenaline as knowledge about their research, should still exist in an academe that increasingly grades its students by online tests. Indeed, some universities have abandoned the practice.‡ Yet each of our three newly capped doctors considered the viva as the high point of their doctoral studies.

Practice varies between countries, universities within countries, and even between colleges or faculties within universities. At one author's university, the candidate faces two examiners (the international examiner providing questions to be asked by the university examiner), with an independent chair. At some universities, examiners' reports are made available to candidates before the viva, a decision much debated. Another author's university candidates face two rounds, a final defence or viva that is open to the public (hence "public defence") preceded by a so-called "private defence" where the candidate meets with the jury behind closed doors.

All share common features. The examination typically lasts around one and a half or two hours, though for two of our doctors, it had felt more like half an hour, while for the other, three. Candidates defend their research typically after a doctoral endeavour of three to four years during which they were responsible for designing and undertaking experiments and analysing and presenting the results. The doctorate is the ultimate learning degree, its conferral recognising its recipient as an independent researcher.

Although vivas are usually associated with doctoral examinations, some universities also use them to examine Masters and Bachelors theses. They are increasingly used to consider thesis or doctoral proposals in advance of being undertaken to check feasibility and award funding. Accordingly, although we use 'examiners' here, they may be interchangeable with 'evaluators', 'assessors', 'jurors', or 'readers'.

Superficially, vivas resemble commission sessions; both place a candidate before a determining jury or panel to be tested in a more or less public arena. Yet they are very different in intent. A commission is eliminative, seeking to reduce a larger pool of candidates until only the requisite number remains. The vetting of candidates for awarding of some scholarships are examples.

Examiners at a viva, on the other hand, are seeking to pass the candidate, assessing the candidate against accepted disciplinary norms. They may use the viva to probe uncertainties or weak sections of a dissertation or project proposal: perhaps the section was badly written or unclear, but the candidate understood the intent correctly. The viva is the opportunity for a panel or examiners to probe in order to satisfy these concerns and for candidates the opportunity to clarify (and often improve) the quality of the work and their skills.

The reason for our three graduates' support of the viva – and paradoxically the cause of their extreme anxiety – goes to the heart of the viva experience. When first asked, all three explained that their concerns arose from fear of stumbling when answering a question. Rosa worried that she would be asked a basic question that she had forgotten the answer to or might not be able to express clearly. All were very much aware of their dissertations' weaknesses, the parts that in the interests of completion or complying with length, were somewhat curtailed. Each was convinced that the examiners would home in on them.

Their anxiety was driven in no small part by their awareness of what was at stake, their 'one chance', with each seeing three to four years of their lives in the balance. Yet, logically they knew that at worst they faced painful, but not insurmountable, emendations. If failure was likely, they would not have been allowed to proceed to the viva in the first place. This of course is different from a grant awarding session where one may be admitted, then fail.

Rather, at the viva each candidate was forced to confront their ultimate academic fear – to be found inadequate and thus an imposter. Alec felt he was defending his own doctoral experience and that the examiners were questioning his own experience. Further, there was nowhere to hide – "you can't exaggerate or obfuscate. You have to be rigorous and justify your position. It puts the essence of who you are [in choosing the method]." It was precisely because that they had nowhere to hide that gave the viva its value. Rosa was very clear, "being able to answer the questions posed shows that you have written it yourself and not had it ghost-written [e.g. using artificial intelligence tools] – there is no ability to fake knowledge."

However, it was not just quick and accurate recall, being able to think on one's feet and articulating the ideas that were important to these doctors. Their audiences and the examiners were equally important. Each faced a panel or jury of recognised experts in their field who would spot flaws and incongruences immediately. All three considered that defending their dissertations against such people gave credibility to their research. More broadly, by defending their research against such experts, they validated their admissions as senior scholars, exorcising the imposter syndrome for once and all, able to state, "I defended my ground."

‡ Some universities have responded to COVID-19 by holding defences online, typically via video platforms such as Teams, GoogleMeet, Zoom, Teamtalk or Skype. Online defences do not seem to be fundamentally different in an academic sense, though differences appear to be that the vivas are likely to be less of an occasion. Instead, they may be more compact, less spontaneous with less interaction or back-and-forth debate. Certainly, the atmosphere is less ceremonial and far less personal. Nevertheless, we are confident that our guide that we present here will hold equally well in online defences as in 'live' vivas.

It was with this realisation that two of our doctors began to enjoy the viva experience. The examination then became a conversation more of equals where everyone "bounced ideas and developed ideas further than were [presented] in the thesis." Gabi found this experience very rewarding, and he was "quite sorry to see the end of the exam as it was fun at the end." Alec recalled, "you get a kick from being able to discuss your work once the exam settles. The examiners had all read the thesis, so they could talk about it." For all three not only their credibility and reputation in the eyes of the assessors were at stake, but their performances in the eyes of peers, relatives and friends also weighed much on them.

To get to this stage, our three new doctors had undertaken their independent research under the guidance of their supervisors in order to write their doctoral dissertations. Their supervisors had also coached them, mediating their examiners' written reports, organising mock viva examinations, helping them craft answers and refutations to possible challenges and preparing them psychologically for their vivas, in short how to answer in an academically rigorous manner.

Although the viva may seem a curiosity of academia, oral communication of research findings is an important component of the repertoire of skills required by any academic. Very often in professional life one has to stand in front of different target audiences to whom a specific and sometimes complex message must be delivered in a clear, insightful, and convincing way. Further, the null hypothesis of the Western science tradition sets an expectation that the researcher's findings will be contested and tested, just as her research was explicitly intended to test accepted theory.

Public speaking and presentation skills have become increasingly valuable in the current job market and may help creating opportunities for career advancement and increase employability. Besides these personal benefits, the importance of scholarly communication lies in its intrinsic potential to advance the discourse of a topic. In the academic community, moments of communication range from small-scale and informal discussions among fellow-students and colleagues to national and international meetings and review panels, as well as public communication on scientific topics to non-experts. One might also benefit from communication skills to defend a case, such as for example during a project proposal or thesis defence. The outcome may be very important yet depend on small but critical elements.

Today, most teaching programmes include 'presentation skills', and it is often assumed that these skills are gained through recurring written and oral assignments, preparing and attending class presentations, or through specialised courses. However, we have noticed that in the process of education training on 'presentation skills', the main focus generally is on the presentation *per se*, i.e. on how to convey a message using a PowerPoint® presentation, or in a talk of a delimited duration, and much less on the epistemic attitude of professionally and satisfactorily answering questions and respond to critique. Such critique can range from issues of factual correctness, a challenge or even a misunderstanding to blunt error. Students or researchers are rarely trained to understand what brings the 'other side' (examiners, evaluators, potential future employers) to ask such questions. As such, they may be unaware of evident mistakes and not concerned with the outcome during the process. Even the most gifted and talented speakers may own up when missing the point or otherwise giving evasive answers. Yet much may depend on it for their career and job performance, self-esteem, and also for the quality and quantity of scholarly communication, debate and rebuttal. Eventually, it relates to the quality of the scientific process and science community.

Although the viva is the penultimate doctoral experience, we have found very little that addresses the impacts of the viva experience, or is presented in a way that provides helpful advice for candidates to negotiate the power relationship so that they can enjoy the experience. While a literature exists, some of these concerns identified are at a level far beyond the control of candidates. Several researchers, for example, have addressed the value of the viva as an assessment purpose, process and assessment criteria (Powell & McCauley, 2002). Concerns about the consistency between universities and different national approaches have also been raised (Pezzi & Steil, 2009; Powell & McCauley, 2002; Tinkler & Jackson, 2002). Such concerns can only be addressed by the candidate when choosing the university at the start of the doctoral experience.

Several researchers have reported on the viva experience to identify important elements to assist future candidates. Murray's authoritative *How to survive your viva* (Murray, 2015), now in its third edition, is comprehensive. She provides a thorough analysis of process, with helpful checklists for each step of the way. Intended for candidates, supervisors and examiners, it is almost overwhelming in its detail. Others provide practical advice, perhaps most notably that candidates should participate in mock vivas beforehand (Hartley & Fox, 2004; Watts, 2012; Wellington, 2010).

Others explore the viva itself. Davis and Engward (2018) found candidates' experiences could be grouped into four themes: academic argument, candidate emotions, fairness of the process and practical issues such as room and lighting. Tinkler and Jackson (2002) identify three components of a viva: skills, content and conduct. Although analytically interesting, they have limited applicability for assisting the candidate. Davis and Engward's last two themes are clearly beyond the candidate's control. Most of the other themes embody the entire doctoral experience and cannot be addressed at the end of the doctoral experience. Thus, the academic argument should have been addressed well before the viva. We would argue that that skills and content are part of the doctoral acculturation that candidates gain through their doctoral studies from attending and giving seminars and conference papers. Tinkler and Jackson's 'conduct' speaks more to how the candidate acts in the viva, but this is more a cultural theme, the alignment of the candidate with the mores of the discipline.

The viva is also a psychological experience that mediates the academic experience. Wellington considers "the viva is essentially an emotional experience and, although this may sound very un-English, this emotional aspect needs to be considered and prepared for" (Wellington, 2010, p. 83). Davis and Engward (2018) identify the power of examiners over the candidate in the viva: in particular, their ability to affect the candidate's emotions, to facilitate a fair examination and apply university regulations with fairness.

Our approach seeks to ensuring the prepared academic argument is sound and is able to be clearly presented by empowering candidates by identifying the power relationships, and ways to redress this perceived and actual imbalance: through understanding the power relationship, but also allowing them to reframe the experience (as performance) and suggesting techniques to help prepare candidates to reframe.

The experiences described by our (non-scientifically selected) sample of newly minted doctors are consistent with other researchers' findings (Hartley & Cox, 2004; Wellington, 2010). Importantly, they resonate with our own experiences as undergraduate, graduate, doctoral or postdoctoral students and researchers, competing for grants and applying for promotions. We have also sat across the table to assess next-generation students and researchers, or peers. We feel our efforts could have been more efficient or satisfying if we had been trained better instead of being thrown into it, and we know many young researchers in many countries feel the same way. There is an entire industry peddling books and techniques that promise purchasers perfect presentations. We argue that the viva is much more than a presentation, although presentation is an important part. As our new doctors identified, the viva is a contestation within a constellation of asymmetrical power framed by a particular epistemology. We also acknowledge the apparent paradox within our own discipline; of the viva as an apparently positivist debate on a rational subject that is in fact very human in nature and consequence. It is one of emotions where the candidate's own self may seem to be under scrutiny and one where the Ph (philosophy) of the PhD is encountered. Bolker (1998) writes about the viva as that point in time when the candidate becomes aware of the gap between the thesis they thought they were going to write at the start of the whole process and the thesis they have actually produced.

More fundamentally, science is advanced by questioning and contestation. Although the viva is the defining moment of the doctoral process (Murray, 2015), doing good science requires reflexivity, with candidates reflecting on their work at all stages of their doctoral research. Accordingly, preparation for the final defence threads through all phases of the thesis, in the proposal, undertaking the research and the analysis and write-up of the results, as hypotheses are proposed and tested methods justified, and results explained. Candidates, guided by their supervisors, in short should have already asked themselves questions harder than those of the examiners.

In this paper, we address the skills of answering and defending rather than presentation *per se* by focusing on the question '*What is the nature of the question and what is an appropriate type of answer?*' and present a decision tree which follows a series of steps to consider for anyone who must stand in front of a committee, a jury, an examiner's audience, or simply a non-expert audience. We comment on each step and provide suggestions on how to prepare the session. We also address the emotional aspect of the viva that we all identified from our own experiences and described by Wellington (2010) and Watts (2012) and propose a way of mentally framing the viva in a way to harness this energy to support the candidate and help creating a positive experience (cf. Kumar et al., 2024).

In doing so, we locate ourselves within a particular epistemology and draw on more than 200 years of summed experience in teaching in international course programmes in molecular biology, marine ecology, human ecology, tropical biodiversity and ecosystems, and environmental sciences.

We firstly frame the nature of the viva as a power relationship and explore the implications of how candidates must negotiate the embedded politics of the personal and recognising some of the cultural challenges that might play a role in developing efficient research defence skills. We then present a typology of questions useful to candidates before presenting techniques for negotiating the trial by ordeal. Though such skills may appear to be based on tricks and trained replies, essentially it is about scientific attitude.

The Power of Argument

Our three doctors realised before entering the examination room that the viva was an exercise in power. Alec recalled,

> "*Everyone tells you [that] you are equals, and that there is nothing to be afraid of, 'everything will be fine'. That's the theory. But it is an exam, and the power is with the examiners. You depend on them, even if it is not palpable.*"

Examiners clearly have power to decide or, at the very least, recommend the candidate's fate. It may however be a misconception in the eyes of the candidate that the examiners form a monolithic block: Different views and opinions may be present.

Whereas many people would consider rationality defines power – the strength of the argument is in its substantiation – others take a very different view: That power defines reality and rationality (see Flyvbjerg, 1998). Those with power define what is to be discussed, the emphasis given to particular aspects.

Rational argument according to this view is one of the few forms of power the powerless have, hence the appeal of the Enlightenment project to those outside power. Machiavelli cautioned of the need to distinguish between those who to achieve their purpose can force the issue and those who must use persuasion; in the second case they always come to grief in his view (Machiavelli, 1515/2005). Relying on rational discourse in this world is to be hopeful. It is often debated what makes science universal or at least widely comprehended even amongst scientists who never met or collaborated. This would be its 'method' in the widest sense. It is the general approach and how it leads to the stated outcome that is on the table or in the air during a viva.

Although their actions are mediated by the prevailing institutional arrangements governing examinations, examiners frame the examination within those constraints by determining what questions will be asked and how the answers are to be received and responded to. The challenge for the candidates is to reduce the power imbalance to advance their own interests. Wider institutional arrangements that frame the examination are beyond the candidate's control or influence. Perhaps they were factored in when deciding which university and faculty to take the undergraduate, graduate or doctoral studies. Rather, candidates are restricted in what they can control: situating themselves within the disciplinary epistemology and in the politics of the personal. Intuitively perhaps, our candidates opted for *Realpolitik*.

Our doctors had developed strategies to at least minimise antagonism with their examiners. Each had researched how much their examiners knew or were familiar with the topic: "some questions were open, so you need to know where to pitch the answer, at a basic or more advanced level", explained Rosa. Alec had carefully analysed each examiner's report to understand them better. There was unanimous support for humility being a very important attribute to bring to the examination. Rosa suggested candidates:

> "*Answer nicely if they ask about something obvious in the chapter - 'don't offend!' Treat the examiners with respect and match the tone set by the examiner.*"

Gabi advised future candidates never to be defensive, but to acknowledge suggestions, "smile and nod, and observe that it is 'an interesting idea'" (if chances are that it is). He considered any emendations might in fact be quite different to what is argued or stated in the examination and so reacting strongly might prove counter-productive. At the same time, the viva is an arena of contestation and humility is not the same as acquiescence and candidates are expected to hold their ground – civilly. Both Alec and Gabi acknowledged that the discussion in the viva strengthened and augmented their theses (through minor emendations).

Framing the Argument – the Disciplinary Epistemology

The discipline and research topic determine what type of responses are acceptable to the examiners. Different ontologies demand different responses. We are all aware in public politics, and some of us in academic politics, on the reliance of rhetoric rather than facts to win arguments. More recently we have seen the power of 'alternative facts'. While eschewing the last, we emphasise the importance of understanding the arena in which the defence is to be mounted.

For the main part, the course of study and research has acculturated the candidate to the discipline. The challenge comes where the jury or panel is multidisciplinary in composition. Suddenly, the candidate is subjected to examiners who read and write in a different discipline, may use words in either a completely different way or, more dangerously, in subtly different ways than in the home discipline. Soulé (1995) gives nine definitions for 'Nature'. Many words highly used in daily discourse, such as 'sustainability' (Hopwood et al., 2005; Hugé et al., 2013) are panchrestons, used in so many ways to become almost meaningless without the required context. The candidate needs to make clear what is meant to avoid discussion at cross-purpose. Ideally this is already done at writing stage, as suggested by Golding (2017), who identified 11 things that thesis examiners do as they read and judge a thesis. Additionally, other panel members may have overlooked misunderstood arguments of both the candidate and their own peers: "who is right?". Courage of conviction is required.

Cultural Challenges and Power Dynamics

Cultural identity or background influences the way individuals respond to questions. This remains unrelated to the intrinsic quality of the work or scientific attitude. Mismatches in the dialogue style lead to misunderstanding and possibly erroneous evaluation. This is a difficult and delicate terrain that cannot be neglected. Western, or "European", academic culture and individualist societies can be typified as 'interrogation' cultures that reward direct and, in the context of the present paper, assertive responses. In contrast, many Asian and Pacific cultures have traditions of deference towards persons higher in rank or with seniority in the process or age, to the extent of acquiescence or silence rather than contesting an assertion. These cross-cultural differences were documented by Kemmelmeier (2017) who reported that acquiescence is indeed valued less in individualist than collectivist societies. Smith (2004) identified geographic differences with South-east Asian but also some Latin American countries as having high levels of acquiescence. In contrast, the countries with low levels of acquiescence were all European and North American countries. Similar results were found by Harzing (2006) with the added complexity that within a country different ethnic/cultural backgrounds may lead to different response styles.

Scientific principles for argumentation must be universal, but the form and the embedding may be culturally influenced and context dependent. For instance, humbleness in the way an interlocuter is addressed is appropriate as long as the scientific basis of the response is correct. Answering, "*You are right, Professor*", where the interlocuter is wrong is not only bad for science but for the candidate, as jury members that have not necessarily read the work that is being interrogated and "badly" defended will be led to believe that the examiner is right.

Our assessment of this type of cultural challenge is that we are scholars, and while respecting cultural acquiescence in everyday life, we have the duty to educate students to practice well-motivated assertiveness rather than acquiescence in scholarly rebuttal. We also maintain that cultural differences do not affect academic quality of research or vivas.

Power dynamics may also manifest in worse forms such as unfairness, or perceived unfairness, and even aggression among others and may affect the outcome of an examination. We refer to Stephenson et al. (2024) who classified themes that emerged from a systematic review of the literature on viva experiences under 'emotional response', 'psychological impact', 'power', 'examiner conduct' (i.e. 'examination techniques' and 'interpersonal style'), 'fairness', and 'practical and procedural issues'. In no way do we idealise the viva, which emerges from society and carries much of the shortcomings of social intercourse. We also acknowledge the existence of viva alternatives, such as the technology-assisted viva voce exams, perceived to be fairer and less anxiety-inducing than the traditional viva (Alcorn & Cheesman, 2022).

Not All Questions Are Equal: A Typology

The viva is fundamentally interrogatory in which the candidate seeks to gain and maintain credibility in the eyes of the jury and the public. Credibility of the candidate's research is largely accepted, otherwise the candidate would not have had the jury assembled by the examining institution. Nevertheless, examiners may seek clarification or test validity of elements of the research. Rather, the viva establishes the credibility of the candidate as the author of that research and as a researcher, requiring the candidate to display assurance, but also reflexivity, within disciplinary norms.

Candidates cannot determine the questions, but they do control how they answer. A first step in the answering process is to identify which type of question or statement one is dealing with. Evaluating exactly what is asked, in which form, can direct towards the appropriate attitude to adopt when communicating a reply, and how one could structure an answer. We propose a simple typology of questions, distinguishing between the 'comment' and four major question types, which are outlined in Figure 1, together with strategies to address them. See Table 1 for example questions across academic disciplines together with appropriate and inappropriate responses.

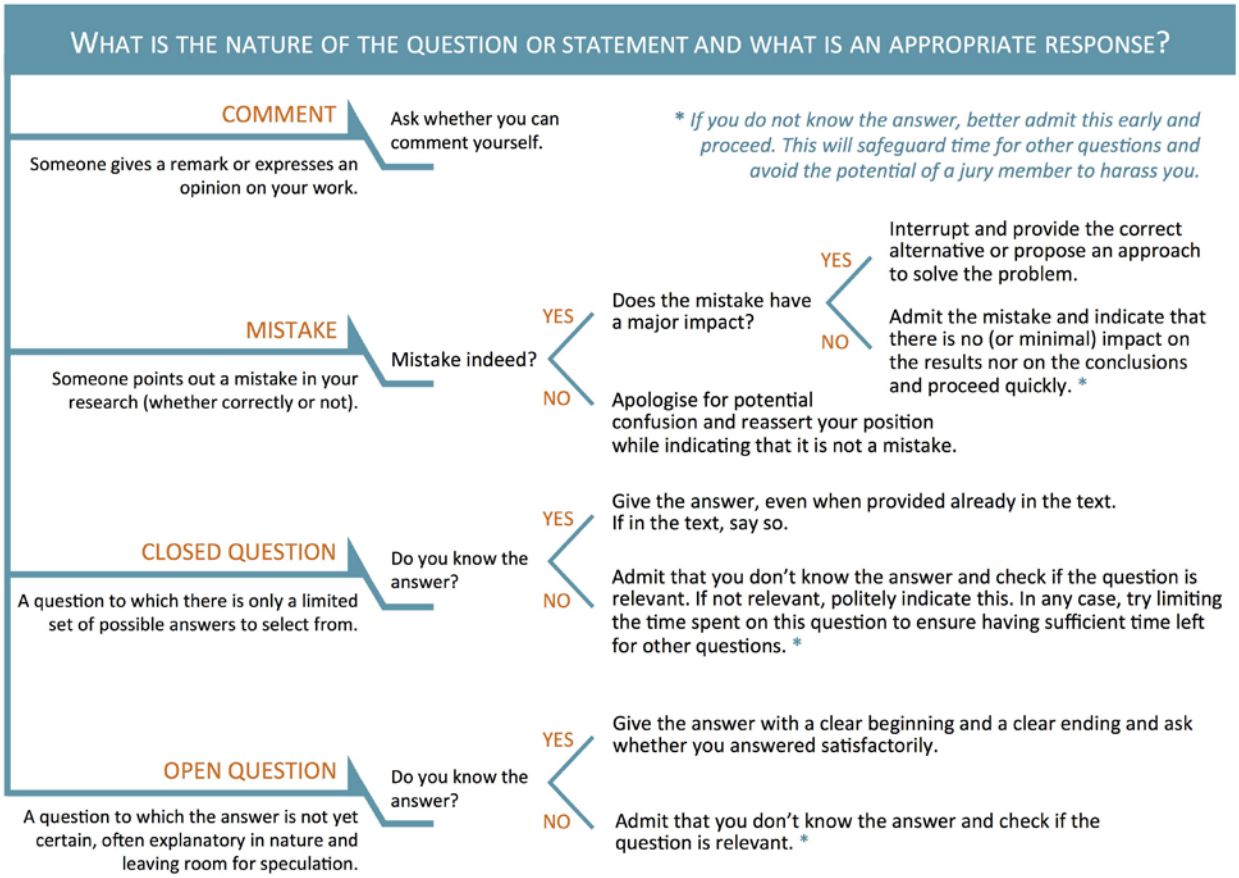

Figure 1. Simple Typology of Questions for a Viva or a Defence of a Project Proposal, Distinguishing Between Major Question Types. A Proposal of Strategies to Address Questions and to Respond to Comments is Given. See Also Table 1

Comments

Examiners may formulate a comment, i.e. their judgment of an aspect of the candidate's research without a follow-up question. Such comments often are a 'dead end' in the interaction between candidate and examiner, after which the conversation moves on to another topic. Comments are often expressed at the start. However, even if it is a positive comment, and certainly in case of a negative comment, it must be asked whether one can reply to this comment. This is best done similarly to the strategy for addressing mistakes in case of negative comments. Positive comments can be reinforced by adding strictly relevant information, not to be overdone. An opportunity to convince the statement's author to readjust a negative opinion, the candidate can convince the other jury members who may not be familiar with particular details of the work. In the interaction between candidate-examiner, candidates often forget that they are engaging with a jury, listening and developing an opinion one cannot know or rebut.

During the question-answering process, the time that is dedicated to talking about mistakes, shortcomings of the work, and gaps in one's knowledge is best limited, while treating these with appropriate attention and correctness (*cf. Guideline 4 – Study Limitations*). Unnecessary detail should be avoided. The time and focus of the audience should be directed towards the merits of the work, which is primarily the candidate's own responsibility. Therefore, every answer must be concluded positively or constructively by solutions/opportunities rather than by problems/limitations.

Mistakes

Inevitably an examiner points out a mistake in the work. Before rushing to apologise or bluntly rebut, it is important to take a moment to consider whether the examiner's assertion is correct, what may have caused the examiner to think that way and to bring it up for discussion.

If the examiner is right, the mistake must be admitted straight away and a mental travel, through the parts of the work that may be affected by it, is needed. Should the impact of the error on the research outcome be minute, it must be said explicitly and briefly clarified why that is the case. In case the impact is significant (unlikely), one can politely interrupt the examiner to avoid him/her exaggerating the mistake and putting more attention to it than needed, further polarising the global evaluation. It is crucial to indicate how the mistake could be corrected, if of course the proper technique or approach is known. The examiner can be reminded of the specific objectives that were put forward and why certain decisions were made during the research process. One must be honest about the research limitations and how they affected the choice and application of the techniques or methods (*cf. Guideline 4 – Study Limitations*).

If the examiner claims a mistake where there is none, candidates often succumb to the emotional pressure of the situation by admitting the mistake. Instead, self-confidence and patience are needed, possibly with an apology for having been unclear or equivocal. It must be stressed that it is not a mistake, and the correct answer can be repeated. The examiner can be directed to the relevant part of the thesis for substantiation (*cf. Guideline 5 – Hanging Jury*). It is a misconception that each and every line and statement in work that is being evaluated is well read, understood, and assimilated by each examiner. The example case sketched provides an opportunity to repeat correct elements of the work, often to be heard by other jury members as well.

Closed Questions

Further, a closed question can be posed to which the answer is known within the academy. Here the examiner knows the answer and expects the candidate to. Closed questions seek to gauge the candidate's knowledge of both theoretical and applied aspects of the research topic. There should be no surprise effect for closed questions directly related to the work, and such questions can generally be prepared beforehand (*cf. Guideline 3 – Possible Questions*). For each step of the research (proposed), the candidate must be well aware what he or she did and why. In fact, all so-called (News) reporter (**W**) questions (why, what, who, where, when, and how), which are the most important questions in clarification of methodology, are closed-ended. The answers to **W** questions should be kept concise, but 'How' questions may take longer to answer. However, it must not be overdone. Instead, asking 'Do you want me to elaborate…?' but without bluffing, because the answer might just be 'Yes, please do!'. Answers to 'Where' and 'When' should be motivated scientifically, not pragmatically.

Closed questions may be disguised as a statement to ask for further clarification of something the examiner did not consider very clear in the work. If the answer to the question is known, it can be given concisely. Perhaps it was already described adequately in the work or project proposal defended, in which case it may be added in the explanation that it was also written in the text. If on the basis of literature or scientific conjecture, this must be made clear and differentiated from data or views generated from the work (Figure 2).

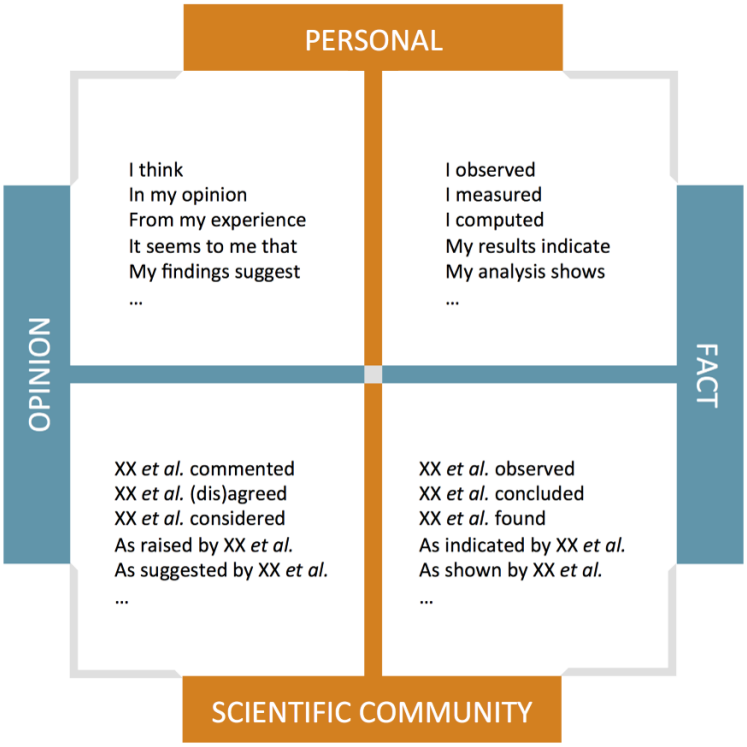

Figure 2. Scheme to Position a Candidate's Reply to a Question or Statement in the Space of Knowledge and Conjecture, While Acknowledging the Degree of Evidence Available (Horizontal) and its Origin (Vertical). See Also Table 1

Where one does not know the correct answer, it is best admitted immediately to avoid further attention given to 'not knowing' at the expense of questions to which the candidate knows the answers (*cf. Guideline 5 – Hanging Jury*). A request to repeat the question buys some time to organise thoughts, but sometimes, by repeating and reformulating the question, the examiner may reveal a clue to the type of answer (or just clarify). Alternatively, the candidate can repeat the question, to make sure it was well understood. However, repeating the question should not be used as a reflex after every question as it may become annoying to the jury or even highlight one's doubts. Empty statements like '*That is a very good question*' fail to hide ignorance and are best avoided.

A question obviously beyond the scope of the research or the work must be politely indicated. An examiner may do this deliberately, for instance to draw the discussion towards his/her field of expertise (he/she might be more familiar with a different technique). In such situations, it is best to stay focused on the candidate's research. Examiners usually appreciate that one acknowledges the boundaries of own knowledge. Eventually, one defends the work presented, not those options and trajectories not taken.

Open Questions

A more elaborate answer is expected for open questions. They test deeper and broader insight into the research and its implications. More so than closed questions, open questions may contain a surprise element. The answer is typically not generally known within the scientific community and evaluating the correctness of the answer hence relies on the logical reasoning and the facts or arguments that are put forward (Figure 2). If one has no answer to the question, it can be dealt with in a similar way as a closed question. It is important to structure it rather than uttering all that comes to mind instantaneously. The answer must be opened with a proper introduction by clearly giving a short outline of the different elements of the answer and concluded with a clear end, redirecting to the question. After longer and multipart answers, or when the examiner's body language reveals signs of doubt or scepticism, it can be a good idea to ask the examiner whether the question was answered satisfactorily. If the examiner agrees at this point, the jury cannot come back to it at a later moment with the argument that the answer was incomplete or not satisfactory. Again, it must not be overdone by asking for confirmation after every answer.

Panels are not monolithic entities, consisting of individuals each with their own interests, experiences and subject knowledge. People from different disciplines may also see their world differently to their fellow panellists. Rosa was unsure at what level to pitch one answer: too basic a response would portray arrogant superiority, pitching too high might leave some panellists confused. We suggest a brief broad introduction, followed by more in-depth explanation

Table 1. Typology Example Questions Across Different Academic Disciplines, With Appropriate and Inappropriate Response Types. All Examples of How to Respond Appropriately or How Not to Are Drawn From Vivas That We Collectively Experienced. Examples of Questions Specific to the Research or Domain, Which Can Be Answered Readily by a Student or a Candidate, Are Evidently Not Included Here. Instead, This Table is Conceptualised to Help Formulating Answers to Questions That Require a Response Technique. We Use Intentionally Simple Examples to Have Them Widely Applicable. Items Such as […] and Wording Such as "thus and So" or "such and So" Should Therefore Be Replaced by Domain-specific Information. Reference Names and Years in the Table Are Fictitious

Question/Comment	Appropriate response type	Inappropriate response type
Comments		
"I would have appreciated if the figures would have been larger with a more legible legend."	*"Thank you for this comment, I will pay more attention to this in the future."*	*"It was actually possible to use the zoom tool in the PDF version that I sent in order to make it legible."*
"You use the nomenclature of Wong et al. (2023) while you must use that of Silva et al. (2024)."	*"Which nomenclature is used is a matter of motivated choice. I am aware there are two schools disputing the nomenclature, but I used Wong et al. (2023) because of […]"*	*"I used Wong et al. (2023) because we all do in our research team."*
"You did not discuss the clinical aspects of your research on AD diagnosis."	*"While I do not have the data to substantiate expected clinical aspects because studying these were beyond the scope of my thesis, I believe we need […] experiments to draw that and that kind of conclusions".*	*"This was beyond the scope of my thesis."*
"You did not respect the guidelines of max. 10 display items in your thesis."	*"I apologise for this oversight."*	*"I put 20 figures plus 20 tables because I thought it would make my thesis clearer."*
"[Any comment]"	[If not correct or if well-founded explanation exists] *"Can I react to this?"*	[If not correct or if logic explanation exists] *"[acquiescence or silence]"*
"[Any comment with which you do not fully agree]"	[Polite but assertive tone such as] *"Thank you for this comment. While I do not fully agree with your comment because of […], I will take your suggestions into consideration to see how I can improve the text content and structure. I believe I can incorporate multiple opinions as follows […]."*	[Rude tone such as] *"I am a bit surprised to receive this comment on a point that has been implicitly mentioned, and that you either missed or misunderstood. I will not clarify this issue, but I invite you to look at those parts of the thesis again. Thank you anyway for your time and effort."*
Mistakes		
"The relationship in the graph is non-linear and the p-value is wrong."	*"I realise what went wrong. I could have done it better using […]. I believe the implications for my results and interpretation are thus and so."*	*"I did not realise this. I did the analysis in the same way as the previous researcher."*
"The capital city of Burundi is Bujumbura, but you wrongly indicated another city."	*"Bujumbura used to be Burundi's capital city, but this has been changed to Gitega since 2018."*	*"You are right, I will correct this."*
"You refer to the $ without specifying which of the many currencies that use the dollar sign it is."	*"I should have used the ISO standardised 'USD' currency to avoid confusion with 'CAD', 'AUD', 'HKD', etc. and I will make sure that this is corrected for in the further use of our findings."*	*"Doesn't everyone use $ to refer to Unites States Dollars?"*
"In calculating percentages you have used the values of Table X, which are ten times smaller than the correct values."	*"You are right, I apologise for the mistake. However, when discussing the percentages I used the correct values as you can see on page Y of my thesis. So the conclusion till stands as it is, but you are correct that Table X must be corrected. Thank you."*	*"You are right, all results are flawed, the percentages are wrong."*

Table 1. Continued

Question/Comment	Appropriate response type	Inappropriate response type
Closed Questions		
"How was the pH measured during the fieldwork?"	*"pH was sampled with equipment X, of brand Y and model Z using* [for instance] *soil probes. Calibration was done thus and so, and measurements were taken such and so. The accuracy was […]. All samples were replicated as follows: […]"*	*"I received the data from my supervisor who did the sampling before I joined the research unit."* [Samples being collected by a supervisor is OK, but not knowing how they were collected and treated is not acceptable].
"What triggered the fall of the Byzantine empire?"	[If you don't know] *"I'm afraid I will not be able to provide the full answer to the question raised, but I can discuss a few issues that I believe could have contributed to the fall, if you mean 1453 indeed."*	[If you don't know] Resort to off-topic information without reaching any point whatsoever in an attempt to give the false impression of answering the question.
"Who proposed the theory of […] that you referred to in your thesis. Is it still applicable/relevant today?"	*"This theory was developed by Smith et al. (1990) in a context of […]. I have mentioned it because of its historical relevance but its actual applicability was not part of my objectives."* [Possibly this must be motivated]	*"I don't know."* [If it is referred to in your thesis there is no excuse for not knowing.]
"What is the most recent evidence-based opinion on the phylogenetic position of Comb jellies ?"	*"The most recent I may not know, but to the best of my knowledge Comb jellies or Ctenophora are […] according to Hernández et al. (2024)."*	*"I was told that the most recent […]"*
Open Questions		
"Why did you decide to do interview surveys in Brazil?"	*"We selected the country based on criteria thus and so."*	*"I selected Brazil because I speak Portuguese."*
"Why do you plan to take water samples in July-August?"	*"July-August correspond to the dry season, which is appropriate because such and so, but I am aware that there is also a wet season to be sampled in November-December or April-May."*	*"There is no alternative because the period July-August corresponds to the semester break when no courses are planned at university."*
"If you could start over again, with unlimited time and money, how would you carry out your research?"	*"The methods we used were chosen based on advantages and disadvantages thus and so, but I am aware of other (more expensive and labour-intensive) methods that may offer insights such as […]. However, my approach is valid because […]."*	*"Oh, that is an interesting question that I never gave thought. I guess that I would do it the same."*
"You have indicated that there is an important data gap in […]. How must a policy-maker or the authorities respond ?"	*"The policy aspects and governance were not amongst the objectives of my work, and I do not feel that I am an expert. Yet, the question is relevant, and I will try to give my opinion, though not based on evidence or research."*	*"I don't know."*
"Reading your thesis I had a question in which theoretical framework you position your approach, which types of conceptual schools of thinking do you know? If you had to choose another approach, what would be your criteria to decide." [a composite and fairly vague question]	*"If I understand you correctly, you want to know the theoretical framework of my research rationale. Is that right ?"* OR *"I have not understood very well. Could you please repeat your question ?"*	*"I applied the method I found in […] but I have not thought about any theoretical framework or alternative approaches."*

Operationalising the Typology: Enjoy the Show

As our new doctors came to realise, their anxiety stemmed from a lack of (self)confidence, the imposter syndrome. The viva validated their ability. The viva is fundamentally though not exclusively psychological. Much of the preparation is in the head, although ensuring stressors are eliminated by being in time, checking beforehand whether presentation fits the software version on the computer that will be used and whether the data projector displays the same colours as those on the computer screen, and whether animations and embedded links work, help.

Two authors are also musicians. They see little difference between giving lectures and public presentations, including their own vivas, and a musical performance. All are intensely theatrical: opportunities for the performer to communicate their passion for the subject with the audience. In each, the audience wills the performer to succeed, if only to justify the time they invested to attend. The audience is not the enemy, but a vital part of the performance that provides feedback – energy – to reinforce the performer's performance. Rosa noted how encouraging her examiners were by smiling and nodding in response to her explanations. That gave her confidence to continue. Gabi and Alec both enjoyed the discussion with the examiners that their examinations morphed into.

Our musicians have a simple message: enjoy the show – "you are the star, and this is your opportunity to shine!" And employ a simple performer's trick: smile at the audience when walking on stage. The smile engages the performer with the audience and simultaneously relaxes the performer. They repeat another saw, that all the mistakes, inevitable in live performances, stay on the stage. It is surprising how often a wrong note or two, excruciating to the performer, is missed by the audience! For a defence, the candidate is the only person who knows the dissertation intimately, the consequence of writing it, but also because they are the world expert on the topic by definition.

Drawing on our students' and our own experience, we propose a set of guidelines to help realise the performance, but they need to be internalised before they are needed. The orchestra or recitalist has several rehearsals, preferably with at least one in the concert hall, before the concert. The rehearsals address weak spots and identify areas where individual practice is still needed. Similarly, viva candidates will not have the opportunity to consult our decision-tree in the moment. Responses therefore need to be reflexes, not intellectualised. The only way is to practice them in mock examinations with questions following different scenarios, and in other performance opportunities such as school or laboratory seminars and conferences.

Conclusion

A scholar standing before a commission or a jury, whether student, PhD candidate or a researcher competing for a grant, is a common sight in academia: the viva is a characteristic and often critical moment in one's academic career. It is remarkable that rarely much training attention is given to this moment that can change a career path. Yet, very often candidates on their way to this academic transition rite feel they have not been prepared to it. As a result, many enter the examination room with trepidation even though they have already demonstrably mastered their research.

Drawing on our combined experience at both sides of the table, in various international education and research programmes and cultural contexts, we provide some guidelines and structure for candidates so that they can address questions posed to them confidently and successfully. They are intended to improve the quality of the process from the side of the candidate and to raise the success rate. If trained and developed, a candidate may also gain confidence before the viva, which for many is the satisfying and rewarding finale of their doctoral journey.

Ethics Statements

Not applicable

Acknowledgements

We thank generations of students and researchers for having successfully graduated using the guidelines for scientific presentation and rebuttal during their Bachelor, Master and PhD Thesis defences. We thank particularly the Erasmus Mundus Joint Master in Tropical Biodiversity and Ecosystems – TROPIMUNDO / *Mundus tropicalis*, the Master in Marine and Lacustrine Science and Management – OCEANS & LAKES, incl. its predecessors ECOMAMA and FAME, the Master of Science programmes in Biology, Human Ecology, Organism Biology, Geography, Bio-Engineering, Environmental Sciences and Education of Université libre de Bruxelles (BE), Vrije Universiteit Brussel (BE), Universiteit Gent (BE), Universiteit Antwerpen (BE), Universiteit Hasselt (BE), Katholieke Universiteit Leuven (BE), Massey University (NZ), Open Universiteit of the Netherlands (NL), Central University of Ecuador (EC), Brunel University of London (GB), Sorbonne Université (FR), Muséum Nationale d'Histoire Naturelle (FR), Università degli Studi di Firenze (IT), Université de Guyane (FR), Universidad de Antioquia (CO), Université des Antilles (FR), Université Cheikh Anta Diop de Dakar (SN), Université de Dschang (CM), Technical University of Mombasa (KE), Université de la Réunion (FR), University of Ruhuna (LK), Universiti Malaysia Terengganu (MY), University of the Philippines Diliman (PH) and Université de la Nouvelle Calédonie (FR). We also thank Elisabeth Robert for drafting a first version of Figure 1 based on guidelines from N.K. and other staff members.

Conflict of Interest

There is no conflict of interest.

Funding

All authors are funded by their respective institutions and/or projects. The research has not received any specific funding, but the aforementioned educational programmes are mainly funded by the Belgian governments, the European Commission, and VLIR-UOS and ARES university cooperation institutions.

Authorship Contribution Statement

Koedam & McNeill conceived the work, Koedam, McNeill, Dahdouh-Guebas, Van der Stocken wrote the text, Van der Stocken reworked Figure 1 and its context in the text, Dahdouh-Guebas conceived Table 1 with input from McNeill, Koedam and Van der Stocken, Deboelpaep conceived Figure 2 and its context in the text, all authors contributed from expertise, revised the text, added sections, read and approved the final version.

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Appendix

BOX

Guidelines for Surviving the Viva

1. Practice at Any Time and Rehearse

Any thesis student, and academic, should be able to present their work in a few minutes at any time to anyone *ad hoc*. Regardless of context, every opportunity to introduce familiar research allows one to practice and overcome feelings of insecurity. This training also develops communicating with different audiences (e.g. supervisor, fellow-researchers, or lay persons). It facilitates to some degree some automatism, not in the argument, but in the flow of statements one has to deliver. A formal presentation must be prepared and rehearsed live. Omitting this step may be a missed opportunity to reaching full potential and often leads to a disappointing performance.

2. Peer-Learning and Peer-Teaching

Whether prior to a postgraduate defence or conference oral presentation, attend others' defences and presentations. There, the focus is on the approach and process displayed. Attending fellow student defences and taking notes of the different types of questions that may be relevant, in terms of content and style, is satisfying and builds confidence. Note the things the audience appreciate and inspire you and what does not. These are perfect moments to direct you in your preparation. Organise a test defence with fellow students, colleagues or supervisor(s). Inviting colleagues having a different field of study may test your ability to clarify your work to a non-expert audience. On such occasions, explicitly ask people to note anything that can be improved and to provide you with frank feedback on all aspects, ranging from attitude, presentation slides and selected figures, to questions answered during your talk. State the objective of the test defence before you start.

3. Potential Questions

Candidates cannot get the exact questions beforehand and prepare all answers accordingly. However it is possible to prepare for *potential* questions. Write them down and provide answers while going through your thesis and related material. It helps to articulate all possible answers aloud (not mentally) and hear yourself formulating. It will increase the fluency of your answers and increase your confidence.

The strategy in preparing for potential questions may differ between preparing for an oral exam for a thesis defence and a particular course unit, as the familiarity of the examiner to the topic may be strongly different. Examiners are indeed often teachers of courses followed during the course programme, but their attitude during an exam may be very different from their attitude on a viva. The examiner of a specific course unit, for example, is most likely an expert in (part of) the field and questions will cover the range of the course unit. In contrast, members of a thesis jury may not have a strong affinity with the thesis topic. This does not make it easier though, as questions may be based on the reviewer's experience with other systems and processes, and sometimes even seemingly naïve. Screening the jury members on their expertise and published research may be a good starting point to reflect on what examiners could ask in view of their background and think about the transferability of the concepts and theories that characterise their research. Though straightforward, it is worthwhile to go over the jargon in your thesis work or proposal again and make sure you can explain them in layman's terms. Exercising with an audience of peers which are slightly outside your own discipline will generate unexpected, fresh (and difficult) questions. Finally, no one knows better than you, but do not underestimate your examiners. Read your thesis or project proposal again and wonder what you would ask if you were on the jury.

4. Study Limitations: Front-Up

Research can always be improved and benefit from further study or (model) results that need to be evaluated against observations. Also, assumptions often need to be made, for example when dealing with the inherent stochasticity of natural systems. Additionally, unexpected events during laboratory or fieldwork may have forced researchers to change tracks. You should explicitly address rather than hide or ignore these research components and their importance. Both you and discipline will benefit from pointing out specific limitations in your work. We refer to high-profile scientific journals that appreciate special mention of 'caveats', 'shortcomings', or 'limitations of the study'. This is valuable in terms of the reader's interpretation of the results and conclusions, but it also helps in formulating future perspectives and research directions. An important note here is that when raising the shortcomings of your study, or in the case they are being highlighted by reviewers, one should make clear having considered the potential impact on the overall research findings and address why certain decisions have been made in the research process.

It is not uncommon that reviewers question a particular technique or model assumption, and for various reasons. When being confronted with such questions, remain alert and be confident in the work you undertook and the decisions you made. Avoid undermining your work. Instead, think along with the examiner and consider the very reasons/motivation of the examiner confronting you with these questions. Generally, assumptions and decisions are made for well-thought

reasons, which you should state clearly and support in a way that is scientifically meaningful (have you?). Additionally, there may be financial or time constraints that you may need to address, especially when being asked why you did not use fancy technique x or y, or why you have not considered other aspects that may indeed be relevant. Maybe you have considered some of the suggested methods or techniques earlier on and they did not work out, or other studies have shown them to be less useful it the context of your study. If so, say so, or thank the readers for their suggestions and consider their potential in future work. Do not let an examiner draw you out of your comfort zone by engaging in a 'why not' strategy with respect to the methodology used, but counter it with a 'why so' strategy. You have to defend primarily what you did do, not what you did not do. In many cases, the use of equally good materials and methods may have been employed and final choice becomes a matter of opinion/habit/taste. However, it pays off knowing the advantages and disadvantages of a wide suite of methods so that you can justify answers to 'why not' questions by highlighting why your method worked (best) in your context and why you omitted alternative methods.

5. The Hanging Jury

Despite the power imbalance between examiners and candidate, do not assume the jury intentionally asks questions to break you down. Whereas this might be partly true in selection commissions, this is definitely not the usual practice for MSc or PhD thesis defences, during which examiners have the *a priori* aim to let meriting students pass, albeit after proving the merit. However, different examiners have different styles, and they cover a broad spectrum. Some jury members may take a *defensive* position and make you feel at ease, others may be more *offensive* and drive you to the very limits. Uncouple the intonation of a question from its content. Some rather easy or straightforward questions can be formulated very aggressively, while tricky or complex questions may be disguised by a friendly tone. It is important to remain alert throughout the presentation and question rounds: a simple, or odd (theoretical) question may be the open trap or pave the way to a very tough one (unexpected questions).

It happens that examiners themselves may try to show off: remain polite but assertive. Dare to question an examiner's statement or say that he/she is wrong and support your objection. One of the most common answers in defences is that the student wrongly admits that the examiner is right, replying "*You are right, Madam/Sir*" (e.g. out of respect), when the examiner is wrong. Less common may be that the examiner does this deliberately, as to test you. Be careful here, as you may blindly agree with a statement that may undermine other aspects of your work.

Jury members generally have an ever-increasing workload and often do not read every word in your thesis or proposal. Hence, examiners may surprise, when they come up with questions on issues that are stated clearly at some point in the thesis or proposal. Avoid offence, and clearly refer to the section in your work where this information is outlined and provide the examiner with a clear answer.

Lastly, while the jury mainly wants to test you (a thesis defence is a moment of examination) on your capacities and attitude as an emerging scientist, you should also appreciate the time they have spent in reading and reviewing your work, most of whom are not evil but also willing to provide an avenue for constructive discussion and feedback.

6. Avoid Off-Road Driving – Answer the Question

By far the most common error is that students forget to answer the question. This may be deliberate, when a student masters the art of question dodging, which consists of avoiding a question with a generic answer. More likely though, students may have misinterpreted the question or go off-road as to avoid awkward silence. In any case, avoid going there. Repeat your examiner's question if you are unsure about what it is that he/she asked (particularly after a long monologue). It is worth to take notes (bulleted, keywords) while the examiner asks the question, especially to keep track of sub-questions. When answering, and if relevant, it can be useful to repeat what you have explained during the presentation or what you have written in your thesis or proposal ('teach' and 'inform' the public/other jury members, even those remaining quiet), but do not add off-topic information just because you prepared to present this answer. Lastly, do not stop listening carefully to the question halfway through because you think you know what the question is all about, nor interrupt the examiner.