On Embracing Errors

Valedictory lecture

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Introduction

Esteemed Rector, dear family, friends, colleagues and students,

As some of you know, I've been playing competitive bridge for a long time. Bridge is a challenging sport; on average, one board lasts 7.5 minutes, in which time you have to process a huge quantity of bidding and play information. You can't play bridge flawlessly; dealing with errors is actually the essence of the game. During a match, it is crucial to put a mistake immediately out of your mind, and continue with the next board. If you don't do that, you are likely to also make a mistake in the next board, because your mind is absent. After a match, it is necessary to face every mistake ruthlessly, analyze it, live through it, embrace it, so that you learn from it, and do better next time. Bridge is played with a partner, who also makes mistakes. Here the following role applies: all negative energy you spend on your partner's mistakes is counterproductive; it disrupts your own concentration and that of your partner, thus leading to new mistakes.

Bridge can be seen as a metaphor for life in general; here, of course, I limit myself to academic life. In this hour I want to reflect on the three core tasks of my scientific work: research, education and administration. I'm certainly not just going to talk about mistakes; you should see it more as a *leitmotif* for this talk.

Education

In this speech I would like to break with the habit of speaking first about research and then about education. After all, it's not for a good reason that my position is called "professor". So education first.

Every teacher knows the two opposing feelings that teaching can arouse. On the one hand, the almost existential fear that you can't do it, that you will fail; on the other hand, the deep satisfaction it gives when you feel that you have been able to teach people something. I started teaching at a time when university teacher training did not yet exist. I can assure you that fear has long been the dominant feeling for me. I also thought that I did not have the qualities to teach well, or at least adequately. Crucially for me, however, was that after much hesitation, I overcame my embarrassment (something that men in particular have a hard time with) and asked an experienced colleague to sit down with me at my lecture and tell me what he thought. The feedback was substantial, to say the least. I gradually noticed however that, even if you are a less gifted speaker, you can learn almost anything, and moreover that students are very benevolent in their evaluations if they feel that you are trying to do your very best. In addition to the compulsory teacher training courses, which we are fortunate to have now, teaching is also a matter of lifelong learning. Intervision, in small groups of experienced and less experienced teachers, is the appropriate means for this. The intervision group should be the place where you as teachers can talk openly, honestly and safely about each other's problems, errors, and solutions, and thus give substance to the reflective attitude without which the university loses its raison d'être.

Another lesson that I learned late in my teacher existence has to do with the way we structure courses nowadays. For a variety of reasons, which we usually refer to as "studyability", but possibly also related to things like fear and yield, I organized my courses very tightly: many compulsory components, deadlines every week, and so on. I know that

education gurus say this is how you should do it, but I've had more and more doubts about this model. The university is pre-eminently the place where you want to teach students to think independently, to be critical, to learn how to plan your time. Wouldn't it be better to make as many course components as possible optional, with only the absolutely necessary ones, such as the exam at the end, mandatory? Of course, as a teacher you want to encourage students to participate in what you offer to support the learning process, but if a student wants to follow a different path for whatever reason, that's fine, isn't it? In the course where I used this last model (in fact, only the exam was a compulsory part; tutorials and assignments were optional) I received feedback from students along the lines of "finally a course where we are treated as adults". A rigid course model may be useful for students in the first weeks of their academic career, when they are still adjusting to the difference between university and secondary school, but after that I strongly advocate a more relaxed course regime.

There is another reason to take a closer look at the tight course model, namely inclusiveness. We expect a certain level of intelligence and motivation from each student, of course, but beyond that, inclusive thinking requires that we, as teachers, make as few assumptions as possible about our students. Take, for example, students with a physical disability. I myself am visually impaired and as a dean I spoke to students with a disability every year. We tend to set up counters for each type of disability, make special arrangements. But these kinds of counters also lead to stigmas, to thinking in categories of people, in other words to exclusivity. It is much better to design your course inclusively. How do you do that? Make sure that students can plan their own study time as much as possible. Offer subject matter in at least two different ways as much as possible. And if there is only one way, make sure it is not bound by time and place. And a number of other such principles. Digital tools that allow students to practice on their own time fit well into such an approach, as does a mix of online and offline education, as we learned during the pandemic. Unfortunately, the VU is taking steps backwards in this area, due to the patronizing advice not to make recordings of lectures (which are time- and place-bound) available to students, while virtually all students I spoke to, regardless of their disability, would be helped by this.

However, we can generally be very satisfied with university education in the Netherlands. I was particularly impressed by the response to the pandemic. While other sectors of society came to a grinding halt, academic education continued online after just a few days. With a lot of creativity and commitment from teachers and students, of course. Really something to be proud of.

Something we as universities should not be proud of is the continuing proliferation of bachelor's degrees, often with fashionable titles designed to attract as many students as possible. It's a vicious circle, which is fuelled by the financing model. As a high-school student you are expected to make study choices that you are not quite ready for yet, resulting in wrong choices and loss of time and money. For the staff, each new bachelor means more work and, above all, more *red tape*, at a time where the workload is already so incredibly high. Nevertheless, we continue to walk this disastrous path, partly because of the extra money that is generated by higher student numbers. You cannot solve this problem at the level of an individual faculty or university. It is high time that UNL, the association of universities, and the ministry together press the STOP button. You don't have to be a genius to understand that a limited collection of broad Bachelor's programs with gradually increasing electives is better for everyone. It's nothing new either; many other countries have

been organizing their education in this way for a long time. For students, it means time and space to discover their ambitions and interests. The educational organization will become simpler and more efficient, so that teachers can spend their time on what they like and do well: teaching. Save the great variety for the Master's programmes, by which time students will know what they want and you can offer specific programs that respond to scientific and social developments. Please let's collectively embrace and get rid of this system error.

National coordination would also be good for the distribution of study programmes across the country. With the exception of medical programs, this is lacking in the Netherlands. Many students nowadays stay as close to home as possible for their bachelor's degree. That leads for example to the fact that students in the North Holland region opt much less often for a technical education than students in South Holland, Twente or Brabant. This while in this era of energy transition and increasing technology there is a great shortage of university-trained technicians. After a call from ASML, among others, we have been offering the Mechanical Engineering Bachelor of Twente in Amsterdam since 2019. A second technical bachelor will be added in September. To be clear: the VU does not want to play a technical university; for specific practice facilities, the students travel to Twente a few days a month. As the responsible dean, I was proud of this initiative;but actually it is not good that we depend on bottom-up initiatives. I advocate a national strategy for the distribution of study programmes; in this time where we have learned to deal with online education, this is also relatively easy to do. The national council of science deans would be an excellent forum to come up with such plans for the science sector.

Research

I now want to move on to the core task "research". Because of my position as dean, I have had to follow computer science research from the sidelines for the past six years. I used to say in the lectures for first-year computer science students: we don't know what world we are educating you for, because in five years the computer science landscape will look very different. And that is still the case, just look at the developments in artificial intelligence. A farewell speech is a good time to take a closer look at your own contribution to these developments.

In the first 12 years of my research I focused on knowledge modeling, in other words the methods and techniques with which you try to represent knowledge symbolically in computer programs. My promoter Bob Wielinga achieved worldwide fame with the KADS and CommonKADS methodology for knowledge modeling, and as his second I profited from this. Of course, that says nothing about the quality of the work. With the benefit of hindsight I now conclude that this methodology was too complex for the systems for which it was ultimately suitable, namely fairly simple knowledge systems, such as for determining eligibility for benefits. At that time, the research methodology for computer science research was still under development, and you can see traces of that in our work. It was also pre-Web: the scope of the systems was relatively small and local, for a bank or government agency. What remains is the notion of reusable knowledge patterns; I see that as the most important result in hindsight. Incidentally, two companies emerged from the KADS work, so the valorization aspect was OK.

Since 2000 I have focused on research into the so-called Semantic Web, a concept introduced by the creator of the World Wide Web, Sir Tim Berners-Lee, to whom I had the

honor to confer an honorary doctorate in 2009. Because of this research I transferred from the UvA to the VU in 2003, to join forces with colleague Frank van Harmelen. That was a very nice time; we were both good at attracting external funds, and the collective group grew and prospered, both scientifically and socially. Within semantic web research I myself focused on two themes: firstly, the use of ontologies as background knowledge for Web applications, and second, the using semantic web techniques to make digital heritage collections accessible.

To begin with the first theme, "ontology" is a loanword from philosophy, and literally means "theory of that which exists." In computer science it has a pragmatic meaning: an ontology is a collection of knowledge facts about the world: objects, persons, events, and so on. These knowledge facts can be used as a frame of reference by, for example, search algorithms, automatic language processing techniques and machine learning. Ontologies can also help with "explainable AI": explaining the results of AI algorithms in terms that people understand. This is one of the cornerstones of the Gravity consortium Hybrid Intelligence, led by colleagues Frank van Harmelen and Maarten de Rijke. Ontologies are captured in so-called "knowledge graphs", which represent the concepts and their interrelationships. One of the most enjoyable tasks I have had the pleasure of doing as a researcher has been chairing, together with my American colleague Jim Hendler, the international standardization group for ontology- representation on the Web. My contribution was limited in terms of content, but it was an interesting task to get all the egos, especially the hardcore logicians, to reach a consensus. In those years I learned a lot about consensus processes, from which I profited a lot later as dean. Incidentally, the practical impact of this group was limited. Even though you see knowledge graphs everywhere these days, just think of the frame that appears on the right side of a Google search result, the commercial interests of the tech companies are so big that they prefer to use a proprietary format instead of the public Web standard. It's a sad example of the threat that the power of tech companies poses to the public Web. Another flaw in the fabric; it is high time that we, as a society, put a stop to this.

Applying semantic-web techniques in digital heritage collections was the main theme of my inaugural lecture in 2006. With this I hoped to combine the useful with the pleasant: my work is in science, in my private life I'm more into humanities. Our first semantic search engine, built by Jan Wielemaker, Jacco van Ossenbruggen and Michiel Hildebrand, crashed when the NRC published a short article about our "Art Web". We made mistakes, for example by building an overly complicated search interface. A wise lesson: keep it simple. Later we also started looking at whether we could generate a narrative as a search result. So no single words, but a story. This is important in the heritage world; every exhibition in a museum has a story in which the exhibited objects are placed in context. This was an inspiring collaboration with colleagues from Humanities, under the leadership of Susan Legêne and Piek Vossen.

Incidentally, we had the good fortune that many Dutch heritage institutions wanted to cooperate, with the Rijksmuseum and the Institute for Sound & Vision leading the way. I think it is fair to claim that this work has been a breeding ground for Europeana, the digital collection of millions of European heritage objects. Our former PhD student Chris Dijkshoorn, who now works at the Rijksmuseum, told me that the new release of their digital collection is based on semantic-web principles. It is good to see that the physical and digital worlds are increasingly going hand-in-hand in the heritage sector. Of course it's nice if you have the opportunity to go to a museum in the Netherlands yourself, but that is not possible for a large

part of the world's population. Digital heritage collections therefore increase inclusiveness and equality of opportunity.

As dean I was more concerned with policy matters related to research, such as scientific integrity and sector plans. In recent years, there has been a lot of attention in the press for fraud in science. Fraud will certainly occur, but it is still an exception. Every year, as dean, I received an anonymised list of problems that had been reported to the Confidential Counselors for Scientific Integrity. More than half were about authorship of scientific articles. A scientist who wants to add an extra author to an article without that person having done anything substantial, things like that. As a result, I started teaching about the rules for authorship in the compulsory course for PhD students on Scientific Integrity. A response I regularly get from them is: thanks for the explanation, please tell our supervisors about this. This shocked me; experienced academic staff must teach the younger generation the metier, including the rules that go with it. If you flout the rules yourself, you are setting the wrong example. Moreover, you may well create a socially unsafe situation, because PhD students, fearing repercussions, do not dare to talk about this with outsiders. It is essential that we address this. As before, everyone can make a mistake, but if we don't say anything about it, it can turn into a sore wound. Likein education I advocate intervision groups with experienced and less experienced supervisors.

In the course I just mentioned, our former Rector Lex Bouter gives the introductory lecture on the theme of scientific integrity. Those of you who recently attended his valedictory lecture will know how inspiring and clear he can speak about this. In a nutshell, proper attention to scientific integrity also leads to higher quality of research.

One more thing about scientific integrity. Unfortunately, as a dean, I have experienced that the complaint procedures we have for scientific integrity were being abused to harass honest scientists, for example by climate deniers or by companies for whom certain research results were unwelcome. These people make malicious use of the openness of universities. It is important that we show assertiveness in these situations and stand firmly behind our colleagues and the academic freedom.

As a final point about research, I would like to comment on sector plans. For the uninitiated: sector plans are national agreements on research foci, and how these are distributed among the universities. No single university can do everything, but together we must ensure that the important themes for science and society are covered. The beauty of these sector plans is that they are drawn up by the scientists themselves, and are therefore not imposed from outside. It has created a consensus-oriented climate in the science area. For sector plans you have to give each other something, and we succeeded. Personally, I am especially pleased that the disciplines of earth sciences and environmental sciences have joined forces for these sector plans; together there is now a strong Dutch coalition for climate research; I need not explain the importance of this to you. The Ministry of Education, Culture and Science, and in particular the minister himself, have played a crucial role in the development of the sector plans by ensuring that substantial and long-term investments are linked to these plans. Thank you, Minister.

Management

The third core task is management. A university is largely run by scientists themselves, amateurs in fact. That's quite unique. The term "line manager" is unknown in the academic world. Program directors, heads of department, deans, presidents of the executive board, they are almost always people who are, or have been, active in education and research for a long time. So scientists. It cannot be otherwise in an academic world, where you are by definition working at the frontiers of our knowledge of the world, and where you have to be a bit of a professional idiot to make progress. Excellence sometimes seems to have become a dirty word, but you can't get around it at a university; it is the *raison d'etre* of the institution. You have to have empathy for this if you want to lead it. "Leading" is not such an adequate term anyway within a university. My experience is that you mainly have to ensure that everyone can do his or her thing as well as possible. So you are actually a form of *support staff*, and that's fine.

Incidentally, some of my colleagues look a little down on tasks such as dean and head of department. After all, it is not "real science". I myself, somewhat to my own surprise, enjoyed it a lot. Over the years I have formulated three principles that I believe are crucial for good leadership in a university. I'd like to go through them with you.

The first principle, and actually the most important: organize your own feedback. By that I mean: actively ensure that there are people in your environment who tell you plainly what you are not doing well. The higher you climb on the management ladder, the less people will tell you this spontaneously, so you have to actively take care of it yourself. It is very tempting to think: "nobody says something, so I must be doing it right". But it should be a *red flag* if you don't get criticism. As a leader you make mistakes; this is normal and not bad in itself, as long as you are aware of it and learn from it, just like in bridge. I can give you a list of mistakes I've made myself. I regularly talk too much and can be too harsh on people; I consider myself fortunate that colleagues have helped me to grind off the sharp edges. I leave it to others to judge whether I have succeeded sufficiently in this.

The second principle is: lead ánd listen. Those two are a kind of sacred unity. Leading means that you are not afraid to formulate a vision yourself, to make yourself vulnerable by saying or writing what you think should be done. At the same time, a leader must be a good listener and be prepared to adjust the initial vision; this is not a sign of weakness, but of strength. A leader is consensus-oriented, where "consensus" does not mean that everyone must agree on everything; the latter is a gross misconception: consensus requires the willingness of everyone involved to think about where his or her limits lie, and it is up to the leader to explore these limits in a dialectical way. Leading consensus processes requires a clearly formulated vision as a point of reference for opinion formation. Frankly, I despise policymakers who start with what is usually a very time-consuming and rudderless process of "gathering" ideas and opinions from all sorts of groups. If you do not formulate an idea or vision in advance, people will have nothing to object to. We computer scientists know this problem from software development. It doesn't work to ask people what features they want in a particular program; on the other hand, if you give them a prototype of the program, even a poor one, they will come up with all sorts of useful feedback and ideas.

The third principle is: radical transparency. I deliberately use the adjective "radical", because transparency is one of those terms that people use, without actually doing it. I learned this principle during my work for the Worldwide Web Consortium, the organization that defines

the standards for the Web, basically the foundation upon which the entire Web runs. Every document, every piece of comment, every email is publicly accessible there. And anyone, anywhere in the world, no matter how important or unimportant, can comment. And that happens. For example, I once received comments from a Muslim country about the fact that I used in a document about a web standard examples about wine, i.e. alcohol. You are expected to take any form of comment seriously. A seasoned colleague once said to me: if you think a particular comment is stupid (and scientists we tend to do that), ask yourself if you wrote it down clearly enough.

A public organization such as a university lends itself well to radical transparency. As dean, I have committed myself to making all policy documents accessible via a public web link; every employee may, solicited or unsolicited , provide comments or even write in the document. That sounds scary, but in practice it is not. Radical transparency is a huge help to the aforementioned principle of "listening". You get useful feedback from people you didn't expect it from. Another big advantage: it saves a lot of time if you don't have to constantly think about which version of a Word document you should send to which group. How much time is lost in this kind of administrative processes! And finally: radical transparency stimulates and rewards people who are willing to actively think along with you and correct your mistakes.

Performing a management task, such as being a dean, is just a specific form of leadership. Leadership is something we actually expect from everyone in the university, and especially from those with senior positions, such as full and associate professors. Leadership in universities is under public scrutiny, as we regularly read in the media. Social safety stands or falls with a climate of leadership, in which it is normal to talk about things that are not going well. We all make mistakes, also when dealing with each other; it's only when we don't talk about it that things go really sour. In the cases of social unsafety that I myself have seen, it was not the behavior itself that was the biggest problem, but the silence about it.

During my studies in medicine, I was a student assistant for the course Interview Techniques for two years. I supervised groups in which bad-news and counseling conversations were trained in role plays. In retrospect, that was one of the most useful things I've ever done. I remember the three qualities that make a good psychotherapist according to the humanistic psychologist Carl Rogers; I think they also apply to good leadership. Rogers' three principles are empathy, congruence, and unconditional positive self regard, i.e. a sense of self-worth that does not depend on the judgment of others. I have already mentioned empathy: the ability to to understand what goes on in another person's mind. Congruence means that you are recognizable as a person; this isn't about good or bad, more about not exhibiting Jekyll and Hyde behavior. Unconditional positive self regard is actually the most important. It's not a binary property; we are all sensitive to the judgments of others; it's about the extent to which you are, so a spectrum. If you want to be an open and honest leader, you have to be on the right side of this spectrum, otherwise you fear negative reactions and you don't dare to say what you should actually say. What is also important: this is not just an innate characteristic, you can learn and train this.

In my view, leadership in a broad sense is the crucial part of the national initiative on Recognition & Rewards, led by NWO, the Dutch Science Organization. Leadership skills should be part of the criteria for promotion to the highest academic ranks: associate professor and full professor. In such a position, you are responsible for supervising young academic talent, such as PhD students, postdocs, and teachers with temporary contracts. Of

course you have to be a top academic to hold such a position; that is a necessary but not a sufficient condition. Leadership skills are necessary to properly guide vulnerable talent. The university has the responsibility to prepare the staff for this through training and then, upon appointment, to check through 360-degree feedback whether the required leadership skills are indeed sufficiently present.

Incidentally, I am actually quite positive about the development of leadership within the university community. As dean, I had the privilege of having self-image interviews with all newly appointed associate professors and professors, in which we talked mostly about leadership. I see in the new generation a sense of responsibility, a form of *noblesse oblige*, which makes me optimistic about the future. I also see a reflective capacity in them, which is so essential to deal with and learn from mistakes.

Acknowledgments

I have said. (*Ik heb gezegd*)