Reflective Practice:
its implications for classroom, administration and research

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I am delighted to be here in Melbourne, at this University and in this Department. What I want to discuss is the idea of reflective practice in teaching, and secondarily in administration, and in the classroom. I want to begin with the idea, which was really put forward by a wonderful philosopher of education named David Hawkins (1974), that teaching should be understood as a dialogue of I, Thou and It. I the teacher, Thou the student, and It the subject matter. In order to think about that dialogue I need to think about the student's conversation with the material, the student's attempt to learn about the material, to make sense of it; the teacher's attempt to make sense of the student's understanding of the material, and, incidentally, the teachers' understanding of the material itself. And all of this taking place within the framework of an institution, the school.

Now I am going to talk about some features of reflective practice in the classroom, and one of these I need to get at by telling you a story. The story comes from what was called The Teacher Project, which was run in Cambridge, Massachusetts by two colleagues of mine, Jeanne Bamberger and Eleanor Duckworth. And they worked with some seven teachers from elementary schools in Cambridge over a period of a couple of years. And then a smaller group of teachers continued with Eleanor. They called themselves The Moon Group, because they were interested in the behaviour of the moon; and they worked for some seven years. But the story I am going to tell you took place within the first few months.

The teachers were watching a video tape. And they were watching a video tape of two boys and between the two boys there was an opaque panel and they couldn't see through it, but the video tape was placed above and both of them had bunches of patterns blocks – are these familiar in Australia? They're, you know, flat sorts of blocks of different geometric shapes and colours. And one of the boys had in front of him a pattern and the other just had a bunch of blocks. And the first boy, Johnny, was trying to give directions to the second boy about how to put together that pattern.
And Johnny began to give directions and the teachers watched that tape as the second boy began to try to put together the pattern that Johnny was describing. And at a certain point, the second boy seemed to go astray and had difficulty. And the teachers said things like, 'He seems to have a hard time following directions.' And then they said, "He seems to lack certain basic skills." And then they said, "Perhaps he is a slow learner." And then one of the teachers said, "Wait a minute. I think the first boy gave a direction that was impossible to follow. He said, 'Put down an orange triangle', but there were no orange triangles, there were only orange squares and all the triangles were green." Now you can do this with a video tape – they backed up the video tape. And they looked now at what had happened and, sure enough, he'd said, 'Put down an orange triangle' when there were no orange triangles. And then the whole process looked very different to them. And they said, "This second boy is really a virtuoso in following directions. He was able to take this nonsensical direction and make something sensible out of it. How wonderful!"

And when they thought back on that process, one of the teachers said, "We gave the kid reason." And that phrase, 'we gave him reason', became a slogan that lasted for the rest of their work together. And it had to do with this notion of assuming that what the kid was doing made sense, and trying to discover what the sense was. And I believe that's a very powerful shift of attention – really turning things upside down. Because if you assume that the kid is making sense, even when he seems to you to be saying something puzzling and curious, then you must turn yourself into a kind of researcher; you have to become interested in discovering what is the sense he is making. And it becomes your problem as a teacher to find that out. So this becomes an example of what I call reflection-in-action. That teaching is a form of reflection-in-action – when it is good. The teacher seeks to discover the meaning of what the kid says, and conducts a kind of on-the-spot experimentation when she's puzzled. In this case the experimentation was turning the tape back and testing her hypothesis that an impossible direction had been given.

The moments of reflection-in-action run something like this: First, spontaneous routine activity that exhibits what I would call, following Michael Polanyi (1969), 'passive knowing': knowing-in-action. And then a surprise. And I think surprise is of the essence. It is through surprise, that we come to generate new forms of
understanding. The surprise interrupts the routine, spontaneous activity. And then in response to surprise, the inquirer reflects both on the surprising phenomenon and on how she has been thinking about it. Thus thought turns back on itself and on the phenomenon being thought about. And one then restructures how one was thinking about this phenomenon. As the teachers restructured their understanding of what the two boys were doing - and especially the second boy's intelligence, or slowness, or virtuoso capability - and then seeks to act on that new understanding. And in turn, reflects on the results of that new action. These are idealised moments. The whole process can go very quickly, and I might add, can take place without words.

I find that in my life – and I started to write about this work in about 1975 – so it is the 20' year birthday of this work that I am celebrating in Melbourne – that in my writing, the word reflection has been troublesome, because it suggests what Hannah Arendt (1971) calls a "stop-and- think", which takes place in the medium of words. It is a kind of intellectual exercise. But the reflection-in-action following the process that I just described, can happen very quickly, in an action present. It is, for example, the kind of thing a good jazz musician does at a jazz session. Improvising, listening to how the other musicians are playing a melody, playing it differently because of what I hear you doing, and revising again as I hear your response to me. It also is what we do in conversation. Conversation is an interesting thing, considering that we do it all the time. A bad conversation can be very boring. There was in the United States years ago a record which was called The Babbitt and the Bromide.

The Babbitt says: Hi there.
The Bromide says: Morning.
The Babbitt says: How's the wife?
Just fine.
How're the kids?
Just great.
How's the bus?
Not bad.
See you later.
Right.
This is utterly boring, utterly predictable conversation. But, if conversation were completely surprising, it would be like an Ionesco play, it would be insanity. So a good conversation lies somewhere between boredom and insanity. And in that zone between boredom and insanity, within a broad framework of shared understanding - like the jazz musician's understanding of meter, harmonic progression and melody, because they know the tunes - comes surprise. And in response to surprise, one improvises, and others do the same. And that reciprocal process of improvisation is what I call reflection-in-action. And we are all good at it. And we are almost entirely incapable of describing it. But our ability to describe it depends upon our being able to observe what we do and to record our observation – you have to hang on to it, because you need to be able to look back on it. And we have the ability also, to reflect on our reflection-in-action. That sounds like a fancy phrase but it is very much like what a basketball player does on Sunday morning as he watches the video tape of the game that he played on Saturday night. And he says, to himself, 'My god! How did I let that guard get around me each time? And says, 'Oh, I can see what happened. I waited a second too long. I have to get in there faster.' This he does in words – reflection on reflection-in-action takes place in words. Reflection in action, like the teachers' remaking of their understanding of the second boy in my example, may take place in words, but it may not.

And another thing about this process of reflection-in-action is that it not only applies knowledge, but generates knowledge. And I am very struck by the proposition that practitioners, when they're competent, are not only appliers of knowledge generated in the Academy, but they're generators of knowledge, which shows up in their own practice. And which, again, they may or may not be able to describe. But can describe, I argue, when they observe their own activity recorded and reflect upon it.

Another feature of teaching as Reflective Practice, but very much a piece of this business of giving kids reason, has to do with the phenomenon of multiple representations: that there are different forms of representation and that there are different forms of knowledge and that a teacher is dealing continually with a question of epistemology, that is to say, with knowledge, the nature of knowledge: what counts as knowledge and how one justifies knowledge; and specifically, with a form of knowing which I am going to call figural understandings – one might also call them
'situational understandings' – as distinct from the formal understandings that are practiced in school and valued in school - not to mention the university – and which I would describe as school knowledge. And I am going to illustrate that with a story. This seems to be a lecture about stories. But I like stories.

This one comes from the Russian psychologist, Luria, who was a student of Vygotsky. And Luria, shortly after the Communist revolution, would go down to the collective farms and talk to the peasants and he would show them a bunch of objects, and he would say, "Put together the things that go together". And at one time he showed the peasants an axe, a saw, a hammer, and a log. And he said, "Put together the things that go together." And the peasant said, "That's easy. I'll put together the axe and the saw and the log, because I can use the axe or the saw to cut the log to make firewood." And Luria said, "I have a friend" – and that was one of his tricks, to say, 'I have a friend' – "who says that one could put together put the hammer and the saw and the axe, because they are all tools." And the peasant looked puzzled. and then he said, "He sure must have a lot of firewood". So the peasant's understanding of how these elements go together has to do with how they operate within the situation. The friend's understanding has to do with their falling under a class, which is really defined in Aristotelian terms, that is to say, the members of the class possess all and only the same properties: the situational understanding; the categorical or formal understanding. Kids, like all of us in our everyday life, operate primarily on the basis of situational, or I'll call them figural understandings. School prizes and gives privilege to formal understandings, categorical understandings. And as a consequence there's a leap between the spontaneous understandings that a kid brings to school and the formal understandings which he is asked to learn at school.

Another example of the same sort of thing. A teacher sent young children – they were seven years old - out into the school to measure tree trunks. And she gave them string; and the idea was that you looped the string around the tree trunk and then you came back and you hung the string on the wall and you compared the length of the strings. And one little girl went out and measured the tree trunk and then hung the loop on the wall. For her, that's what it was, it was a loop. And if you substituted the straight string for the loop, you were making it into something else. It could be understood only as a loop.
Another exercise that the same teacher carried out was to get the children to make a graph in which they took the days of the week – Monday, Tuesday, Wednesday and Thursday – and graphed them against the numbers, the dates, and one student refused to do it. He said Thursday and Sunday are not countable. I think it's shocking, isn't it, that the kinds of understanding that we value within the setting of the school are those understandings which require us to abstract from the actual experience of events. So what becomes important is the name of the day, and it's placed within a sequence. Not the quality of the day, not what happens in the day, not the feeling of the day, not the perceived psychological time of the day, but the name of the day and its order in the sequence which we call the days of the week.

A very interesting cognitive psychologist called Sylvia Scribner did a study of milkmen and how they filled orders for different kinds of milk – white milk and chocolate milk and so on; and she organised a beautiful study in which she videotaped the milkmen filling orders. And she discovered that the old-time milkmen filled orders much faster and much more accurately than the young kids. She found that the young kids were calculating the orders using arithmetic. But what the milkmen were doing, the old timers was, they used the box as a thing to think with. So they could see the box and they could see that - there were twelve units in every box – and they could see that there was one missing, so then they knew there were eleven. They could recognise when they saw half a box, they could recognize when they saw a quarter of a box. The patterns of the box became the elements of calculation. And when they were asked to add up numbers, they were not able to do it with anything like the same speed. Things to think with, objects that become holding environments for knowledge, where one recognises the patterns of the object and those patterns become the basis of our understandings.

School knowledge is formal, categorical and also molecular in the sense that it is formulated in terms of building up more complex from simpler units. Situational or figural knowledge is relational, it depends on relation to events; it's drawn from the felt path of experience: next, next, next. And it is phenomenological, it has to do with the feeling of experience.
Another story that illustrates the same property I draw from this same teacher project. My colleague Jeanne Bamberger was having the teachers go through the process of drawing a tune out of Montessori bells. Have you ever seen Montessori bells? They look like little mushrooms. The bell is like this, it sits on a stick and they are all the same, just that they make different sounds. And the teachers watched again a video tape of children building *Twinkle Twinkle Little Star* out of Montessori bells. And what they saw them do, shocked them, because the child would take one bell, which it thought of as the starting bell - bombom; and then it would search for another bell, that went next: [one note higher] bombom. So bombom, bombom, bombom, bombom – and then it would place that bell next to the first bell, and then they would start all over again; bombom bombom; and then it would go in search again for the next bell: bombom, bombom bombom, then search again: bombom, bombom, bombom, bom, and put it down - and so on until they had built the whole tune. And the teachers said, "These kids don't have basic musical skills. They're lacking their basic skills." And Jeanne asked them, "Well what are the basic skills?" And they said, "Well, the ability to know what a C is and what an A is and what a G is - to know what it sounds like." And Jeanne then asked the teachers to sing the note that followed – bombom, bombom bombom bom – "What's the next sound?" And they couldn't do it. The only way they could do it was by starting at the beginning, the way I just did: data data data daa – bombom. But they couldn't identify the bombom until they'd gone through the pattern that led them to that point. Because the understanding of the tune is relational. One doesn't have atomic knowledge of individual pitches, one has knowledge of relationships of pitches. and so the teachers were forced to the very uncomfortable conclusion that they lacked basic musical skills!

But you see, isn't it amazing, that teachers would find themselves in the strange position of teaching their subject in a form in which they don't understand the subject. And I would argue – and those of you who are teachers, I hope you will have an opportunity to come back at me on this – I would argue that this is what our schooling does, it makes teachers teach in bad faith. It makes me teach the subject in a way in which I don't understand the subject. And my own understandings are much more like the child's, oftentimes, figural, situational, relational. And yet, when I encapsulate school knowledge, I need to teach in that way. And the problem of the
teacher is to help bridge, to move back and forth between the spontaneous figural understandings that the child brings and the formal categorical understandings that are prized in the school as school knowledge. Let me quote you a very nice passage from a man named Loris Malaguzzi (1993), who is the quite famous educator who created the pre-school system in Reggio Emilia, in Italy. He said, 'Put more simply, we see this situation in which the child is about to see what the adult already sees; the gap is small between what each one sees, the task of closing it appears feasible and the child's skills and disposition create an expectation and readiness to make the jump. In such a situation the adult can and must loan to the children his judgement and knowledge; but it is a loan with a condition: namely, that the child will repay'.

What does it mean to try to help somebody bridge between understandings? So I'm going to try to help you bridge between understandings. I will draw a parallelogram. How does one find the area of a parallelogram? Well, when we teach that in school, what you usually say is, "Drop a vertical from Point A to the base and multiply that vertical by the length of that base." So you get the formula $A = \text{vertical} \times \text{base}$. The problem with that is that if you switch the orientation of the parallelogram, the child then finds himself dropping a vertical into sheer bottomless depths, and is unable to describe why the formula holds. Now the psychologist Max Wertheimer in an old, old book, that's still a wonderful old book, called *Productive Thinking* (1959), ran a series of experiments with parallelograms [illustrates], in which he showed how you can make a parallelogram into a sort of rectangle – can you see it? So if this is the parallelogram $A$, $B$, $C$, $D$, we drop the vertical and we find this funny little triangle, which can be moved over here.
And if I move that triangle over here and fill in the gap, in fact, what I get is a rectangle. And the rectangle now has as its side the vertical that I dropped to find the area of the parallelogram. So now I can see the parallelogram as a version of the rectangle; and I know how to find the area of a rectangle: multiply side times base. And, lo and behold, that's what I am doing when I find the area of a parallelogram. A parallelogram is a kind of distorted rectangle. If I can see the parallelogram as a rectangle, then I know how to find its area, and I also know why the formula holds.

The process is the same as the one that Wittgenstein (1953) calls seeing as: a seeing of the parallelogram as a form of rectangle. But notice how difficult it is to do. Notice how much is different here. In this second figure here, the one with the dotted lines, this side, which is new, and this extension of the base didn't exist before. And I have now interrupted this, and this side, which did exist, is no longer present. Instead it has been displaced over here. So I have had to make a transposition of these elements, and as I shift from one way of looking at the rectangle to another, the things and relations that were important in the first figure disappear - some of them - and new things and relations become important. So in effect, the ontology of the figure shifts. Which isn't to say that one can't learn to do it simply. In one of Wertheimer's experiments, a three-year old child took a ring – a slip of paper with slanted edges - and put it together to make a ring, which is basically the same point. I have to say that's a rather low tech use of your high technology, I apologise for that!

Another feature of Reflective Teaching that I wanted to call to your attention is the notion that children, although I have described their understanding as situational and figural, spontaneous and intuitive, have very different understandings. Within that broad category, they see things very differently and they come to learn things very differently. And the teacher's problem is to figure out how the kid's understanding and to respond to that. And this was the line that a great hero of mine, Lev Nikolayevich Tolstoy pointed out. Did you know that Tolstoy was a teacher? You knew. So in between writing Cossacks and War and Peace, at the age of about 35, he founded a peasant school on his estate at Yasnaya Polanya, and then he founded another, and before he was done he had seven peasant schools and a Teachers Training Institute and general college, in which he wrote this piece on the Teaching the Rudiments and I am going to quote it to you.
Every individual must, in order to acquire the art of reading in the shortest possible time, be taught quite apart from any other. And therefore there must be a separate method for each. That which forms an insuperable difficulty to one, does not in the least keep back another, and vice a versa. One pupil has a good memory and it is easier for him to memorise syllables than to comprehend the vowelessness of the consonants – [he's talking about Russian here]. Another reflects calmly and will comprehend the most rational sound method. Another has a fine instinct and he grasps the role of word combinations by reading whole words at a time. The best teacher will be he who has at his tongue's end the explanation of what it is that is bothering the pupil. These explanations give the teacher the knowledge of the greatest possible number of methods, the ability of inventing new methods and, above all, not a blind adherence to one method, but the conviction that all methods are one-sided and that the best method would be the one that answers best to all possible difficulties incurred by a pupil. That is to say, not a method, but an art and a talent.

Now if I teach in that way, what I can't abide is the conception of one right answer. If I believe that every problem has one right answer, I can't possibility adapt my teaching to a different understanding held by the student. And, if I wish to give the kid reason and to think that the puzzling comment may actually capture truth, indeed a truth that I haven't yet grasped, then I have to be willing to see uncertainty and confusion as appropriate. And in my own work with students and with myself, I have learned to regard confusion as a sign of progress. So when I become confused, I say to myself, "Well, perhaps you are about to learn something." And when I see that somebody else is confused… In the workshop that I did up at Southern Cross, one of the participants came up to me after the workshop and she said - with a sense of élan and joie de vivre, and not with depression - "I came in here confident and now I feel completely unconfident of my ability to do the thing that I really want to do." "Well," I said, "That's wonderful!" She was unconfident and confused because she had seen the magnitude, the difficulty, of the task that she was trying to undertake. Her previous certitude had been a mask covering over that not knowing. And now she
was exhibiting what I would characterize as real strength, that is to say, the ability to be confused, to be uncertain, and to see your confusion or uncertainty as a sign of learning. Of course, to stay with confusion and uncertainty indefinitely has its own pathology. But to see confusion as a stimulus, as a starting point of inquiry… So do I dare to be confused in front of my students? Well, I better be. Because if I am not prepared to do that, I can't tolerate the risk of reflecting in action with them. So I have to regard it as not a fatal flaw for me not to have the right answer. At the same time that I need to seek to set and solve the problems I am working on. And if I succeed in learning to value my own confusions, and try in get in touch with my own understandings, in my reflection in action with my students, then I also have the possibility of teaching through what I like to the Hall of Mirrors: I also teach the process which I hope they will then carry out themselves.

Now one more example and then I'm done and it's time for you.

This was a problem brought in by a teacher called Mary Rosito, and she had a student in her class named George. I think he was a 5th Grade student. And George, she says, continually brings her very basic questions that are "so covered like chocolate-covered cherries I am still having a hard time digging them out." [She uses very vivid language.] "There had been an eclipse of the sun and George's father had told him that we didn't have it because it was snowing. So George came in yesterday and he said to me, 'What happened to the sun yesterday?' And I said, 'It was up there.' And he said, 'But I didn't see it.' And I said, 'it was cloudy out', and he walked back to his seat still mumbling. And I said, 'George, what's the matter?' And he came back to me and said, 'But my father said we didn't have that thing whatever it was yesterday.' I said, 'The eclipse?' And he said, 'Yes, that's it.' I asked him, 'What did your father tell you about it?' And he said, 'We didn't have it because it was snowing.' I told George that we had it, even though it was snowing, if you'd looked behind the clouds. He walked back to his seat and about a half our later he said to me, 'My father doesn't lie, we didn't have it.' So I asked him, 'George, where do you think the sun is today?' And he still couldn't understand that it was behind the clouds." Now she has an anxiety attack because she suspects he suffers from lack of Piagetian conservation of the object. So she took a book and put it in front of the window cord and asked him if he could see the cord. "And he said, 'No.' And I explained to him that that is how it is
with the sun when it is behind the clouds. And he said, 'But my father…' So, anyway, I didn't know what to do. His father told him there was this really big hole in the sky and George asked me if I had seen the diamond ring. He said his father said it would take a really big ring to fill it. To fill that hole."

OK, the next week Mary came back to the group with an update on George. She said, "I had to wait until the next cloudy day, so I didn't get to him until Friday. I was thinking about him for 3 days. And I thought specifically about something somebody here mentioned: the where as meaning location. When I asked him 'Where was the sun?' - meaning the location, not whether it is in the sky at all - which is what I wanted - someone thought he might have thought it meant East or West, or some location. I wondered how I could phrase my question to him so that he will say, 'It's in the sky' – which is what I want to know if he understands. So when it was a cloudy day on Friday, I asked him 'What happened to the sun today?' And he looked at me like I was from Mars and he said, 'It's in the sky.' He must have seen the look of relief on my face because he said, 'What's the matter?' I said, 'Remember the day of the eclipse when I asked you where the sun was when it was snowing, and you said that you didn't know?' and he said, 'Yeah.' So I said, 'Well, where is the sun today?' and he said, 'I don't know, it's up there somewhere.' That's just what he was doing: he was using the where for location. Then I said to him, 'You know the eclipse we had? Did we have it here?' And he said, 'No. Well, I guess…I am not sure.' I said, 'I guess what I am asking you is: did it happen in the sky over Cambridge?' He said, 'Yeah.' I said, 'Well, did you see it?' George said, 'No.' I said, 'Is that what you mean when you said "we didn't have it" - because you didn't see it?' And George said, 'Yeah. Because I didn't see it.' And then I said, 'But it happened, right?' And he said, 'Right.' I had been on the wrong track with him. He had wanted a point for the "where", to say where in the sky it is, and I was thinking he didn't know that the sun was in the sky."

That's Mary Rosito - a most unusual teacher. And I would just like to point out what she was doing. She begins by seeing he is confused and she ends by attributing the confusion to herself. She takes a statement as a puzzle to be explored and she embarks on a piece of detective work: how could that statement be interpreted as making sense? She goes through a process of on-the-spot enquiry, reflection-in-
action, and reflection on his understanding and of her understanding of it. She invents questions that will allow her to reveal his understanding. She tests her construction of by on-the-spot experiment - the questions that she asks him – and in this sense, she is a form of researcher.

Now all of this happens within the institutional system of the school. And it's very interesting what happened to the teachers who participated in this project after the project. One of the teachers went to a new, experimental school that was being opened. Another teacher left teaching because, she said, "They're not good enough for what I've learned." Another teacher went back to work at a progressive school in Cambridge, The Graham and Parks School. What happens to the school when the teachers begin to become reflective practitioners?

I think what we see happening is that the school is an organisational system that works very hard at constricting and discouraging reflective practice. And I would argue, that that is because the school is built around a particular epistemology: not around knowledge in general, but around a particular conception of knowledge — it is knowledge that is categorical, and knowledge that is molecular and progressive. So that one can learn atomic bits of knowledge - basic skills, basic math skills, basic music skills – in the early grades and piece them together to make more complex knowledge in the later grades. The lesson plan is the fundamental unit of practice corresponding to the schools' idea of a basic piece of knowledge. Lesson plans can be accumulated to make a curriculum; a curriculum is the program and the sequence of procedures that defines a grade. A lesson plan can be delivered in a unit of time, 50 minutes or 47 minutes. It can be delivered to 33 students in a given space. A lesson plan is the basis on which one can determine through testing whether the kid gets the knowledge. On the basis of a number of tests, one can determine whether the kid gets promoted. On the basis of the rate of promotion of the kid, one can determine whether the teacher gets promoted, and how she should be compensated, or not. The bureaucracy of the school - and it is a bureaucracy in very much the Weberian sense - is built around this particular conception of knowledge as a molecular substance that can be decomposed and recomposed; and that one can test for whether or not the kid gets it, whether or not it's communicated. And so we have the notion of covering the lesson plan. I think if I had to nominate my single most obnoxious phrase, it is the
notion of covering the curriculum! What on earth would it mean for me to cover a piece of knowledge? What is it that you are getting when I cover it? How do I detect what you made of what I am covering? And if I should think to ask you and to test, What do you make of this? and I discover that you are thoroughly confused, do I race on? Because I must cover the curriculum? Well, if I'm a teacher operating within the bureaucracy of the school, I may well think I damn well better! Because I'm going to be judged on the basis of 'have I covered it?' It's very much the situation of an industrial worker in a factory who's required to perform a series of operations and procedures, and not to think. And the reorganization, the re-structuring, the re-thinking of a school as a place for reflective practitioners is very much like the process of rethinking a factory as a place in which workers might be able in collectivities to perform a piece of work from beginning to end, held accountable by performance criteria, and thinking through in reciprocal reflection-in-action how best to achieve that performance.

So I would argue that the formulation which is the way I would best like you to think about school reform is how to create environments for reflective practice on the part of teachers; and that when we think about reform in that way – and a lot of my work in the United States is now taken up with this issue of what we call systemic reform – then I think about very much the same set of issues that I confront when I am in businesses or in factories, asking the question: how do we restructure this institution so as to make it possible for workers, and middle managers and others, to become active, participating, creative contributors to the generation of knowledge?

Okay, I will stop there and now be open to your comments or questions.

**Question 1**

Well, you sort of stopped just at the point where I wanted you to continue, in one sense. In that in one of the things about our schools is that as institutions, they lack situations where teachers will engage in discourse about their professional practice. Teaching is an isolating profession and it's hard to get situations where teachers really do try to reflect on their artistry, try to capture their artistry, where they try and.. you know, collaborate with each other in reflecting on their practice. So what sort of situations, what sort of props, not necessarily in schools, but things that might be
available in other professions that might be taken into schools, that we might be able to get the institutions having situations which will prompt that sort of dialogue, of the sort that we want. It's not a very well phrased question but, anyway..

Prof. Schön: I think I get the drift of what you are asking. Schools are lonely places, don't you find? Teachers tend to be isolated in classrooms. They don't talk to one another about work, for the most part. When they are together in the Teachers' Room, the last thing they want to discuss is what happened in the classroom. — I'm making lots of general statements and if it violates your sense of the reality as you know it, I hope you're going to come back at me and tell me. My experience is that when you free teachers up to think differently and work differently with students, their first reaction is often to be at a loss. They say they're too busy to think about their teaching, and when you give them the time, they don't know what to do with it. Which is not surprising: it's what you would expect if a person is routinised and socialised into that form of teaching practice. So the most effective interventions I've seen are those that try to draw teachers together within the framework of a school and to get them to think in various ways about what they are doing. This has taken a number of different forms: I'll mention two of them, and one of them I like better than the other.

The first one is — we've instituted what I think you have in Australia, which is the notion of Performance Standards. You know, the idea is to get rid of multiple choice tests, to get rid of routinised tests, automatically gradable tests, and to substitute quote "authentic assessments", which get at more accurately what kids really know how to do in a field like, say, 4th Grade Math. The New Standards Project which I am evaluating and doing Action Research on, is a project that tries to develop these standards and assessment methods and one of the approaches has been to bring together groups of teachers, both off-site, often at wonderful places like Aspen, Colorado, but also in schools, to think together about a specific piece of work that a student has done. So you get a teacher to look at a student's portfolio in which she is working a math problem and we talk together about what you make of that solution, how would you categorise it, how would you assess it in relation to a set or rubrics such as "understanding complex mathematical reasoning". The teachers are very
excited about that work, on the whole, and find it liberating and go back to their schools energized. And yet I find it very incomplete.

I like better an experiment that a colleague of mine, Jeanne Bamberger, has done, in which she worked with a group of teachers at a school in Cambridge called Graham and Parks, an elementary school, in something called the Design Lab. (See also Schön, 1991.) And her way of working with the teachers was to get them to think not about how they teach, but what they know, around specific pieces of subject matter. For example: What's an angle? For example, building a mobile and trying to understand, What's balance? What's the relationship between symmetry and balance? Constructing a tune out of Montessori bells. Playing with gears and with pulleys and trying to figure out, How would I arrange this configuration of gears in order to lift this weight? And what happens in these sessions, first of all, is it's not easy. The teachers tended to discover that they are confused. And, indeed, I don't know your background, but if you're like me and you start thinking seriously about, What's an angle? it's very easy to get confused. If you don't, that means you're not seriously thinking about What's an angle? These teachers worked together for a year making things, looking at the intellectual issues that came out of making things, and then began to bring the students into the Design Lab. where there were both physical objects like gears and batteries and bells, and also computers programmed with LOGO, so that you could make computer representations of relationships. And they began to move from their understanding of the stuff they were dealing with — in terms of the I, Thou and It, their understanding of the It — and then towards how they thought about how they were interacting with their students. And that sequence seemed to work very well, although it was very difficult, because, through engaging their own understandings, their own confusions, coming to see that they could make inventions — as Eleanor Duckworth (e.g. 1996) says, discovering that they had a brain — they then were able to think differently about how they taught their students. It wasn't possible to begin to think differently about teaching until they began to think differently about their own knowledge. And it wasn't possible to get them to think differently about their own knowledge until they'd made contact with what their knowledge was. Does that…? [Yes, yes, absolutely.]
Question 2
Firstly, the nature of reflection; and secondly, how what you are telling us can assist teachers to be better reflective practitioners. That's what we're want. The way I see reflection, I can see three sorts of reflection: anticipatory, where you say, What's going to happen in the future? Contemporaneous reflection: What is happening now? And retrospective reflection: What happened in that last lesson? Now, for me, all of those are very much conscious, thoughtful processes. The difficulty I have is, your reflection-in-action — if I understand you correctly — is non-conscious, non-logical, non-rational, and so forth. And where I start to find interest, though, is when you start talking about reflecting on reflecting-in-action. My question I suppose is, Why do you call reflection-in-action reflection?

Prof. Schön: You've hit on the central point in the British objection to my work. I've been very honoured lately, a book has come out with the title Against Schön, and it's written by a man named Michael Eraut (1991), who is a philosopher of Education. Basically he wrote, "We've been under the influence of this stuff too long. Let's come off it!" And his central point is the one you just raised. And I find this the hardest one to try to communicate. You see, if I call reflection the process that I go through as I try to make sense of what is before me, through which I come to see differently what's before me, and how I had been thinking about it — not off site, not in a stop-and-think, not retrospectively, but here and now, in some action-present - by which I mean a zone of time in which I can still make a difference to the outcome of my action - then it seems to me that the process I'm going through has all the attributes of reflection, except the one that we associate that term with most directly in philosophy, say, which is its verbal and speculative and critical character. But it seems to me to be absolutely central to recognise that this process goes on, and that we carry it out in our everyday activities; and that we have the ability to regenerate it, to create knowledge; and that it's not non-logical, it's not non-intellectual, because it's non-verbal.

Yet another example:
If a designer draws- I was yesterday at the School of Architecture in Sydney and I talked with the architects about this – and so, a designer draws, sketching, and she has these little objects…

...and she says, "Those are too small". And she then makes them into these L-shaped objects…

...she goes from one to the other. In that process of drawing, she sees that she has created a configuration which has what she calls "an inside-inside and an inside-outside"; she finds in what she has drawn more than she anticipated putting there, and she sees it as significant; and continues now to draw her sketch in the light of the insight that she got through observing what she created on the page that went beyond what she intended. And that kind of process is an example of what I would call reflection-in-action, in designing — in this case, in architectural design. And, the ability to do it is one of the reasons I think that drawing is so critical to design: design doesn't just take place in the head, it takes place on the page. The act of drawing is itself an act of designing. It has this logic or this structure of seeing: I see the first configuration; of moving: I make a move; and seeing again: I see what I've created through the move: becoming aware of the difference, and seeing the possibilities for further designing that come out of what I've done.

Now, all of that can happen verbally, and part of the.. I think it is a paradox: I tell you about it in words because I don't have anything else to work with; I have to talk to you about the process in words, but I want to talk about a process which can be done
without words. I think when a jazz musician improvises, you're hearing a version of a similar process. And the variation on the theme, on the melody that he constructs in the jam session, can be analysed afterwards in terms of its similarities and differences from the theme. We could even discover, you and I, if we go through the analysis perhaps with him, what the logic of the improvisation was. We could see, for example that it may involve the universal of the figure, we can see that it might involve a transposition of the figure; we can see that he might be stretching across the bar line a figure that had to be contained within the bar line. So it isn't as though there's not logic in what he's doing, it's that the active process of doing it, in some here and now, some action-present, does not occur in the mode of verbal utterances and propositions and relations of propositions that we associate with logic. And what I'm really promoting here is the notion that we have a certain systematic blindness, or inattention, to this sort of process. And I think particularly in Academia we have it, because the Academy values words and values speculative and critical reflection. Now I'm not against it — I'm a word-man, as you can see, and even worse, I'm a book man, I don't even like the Net! — So I'm all for the process of reflecting on what we are able to do in action. But I think there is this vast and only partly explored territory of the knowing-in-action and the reflection-in-action that represents something like 90% or more of our human competencies we display in life.

**Question 3**

I am involved in teaching Master of Environmental Science students and for about 15 years we've struggling to build up a... what seems to me, what you've been working with; but our principal reference is a man called Humberto Maturana (1992). Have you come across him?

[Prof. Schön: Yes, yes.]

He talks about, if I understanding you correctly, what you're talking about, but in an even more general sense than you are talking about it. In one place he's written, for instance, that the mind is not in the head. He talks about the generation of being, in the sense, in this interactive mode with nature, and, of course, with each other. I find his work very beautiful, even if somewhat obscure, as you may realise. [Prof. Schön: Yes.] But just, from an Environmental Science political view, a couple of stories:
One comes from Norwood Hanson (1965), who's a professor emeritus [Prof. Schön: I know him.] in Norway. He says, 'Provided we do not pretend to be competent, we know how it's done.' That's one. The other one occurred ten years ago: a child of mine, a second son, who knowing his father was an environmental scientist — 6 years old at the time, and having only ever lived in the inner city area in Melbourne — noticed that trees were being planted in the park next door, and said to me, 'Dad, they're building trees in the park next door to cut down the smog.'

Prof. Schön: I need to discuss that example with you afterwards, okay? But on Maturana: I know Maturana, and I know something of his work and I agree, I think he very much has this notion that the mind is not in the head, it's also in the body, and it's also in action, and that knowledge is in action. I think he is very much attuned to this idea of a transactional sense of what reality is, that we're involved in transactional relationships. But he goes well beyond it in his idea of autopoeisis, in the sense of 'self making', and while I am intrigued with that, I find it obscure and so I have not leaned on him very much for my own sense of what's going on. But I tend rather to lean on certain other people and my own view of things comes out of the work primarily of John Dewey and Dewey's logic. You know, I think if we need to re-understand Dewey; he got a bad rep because of what the progressive schools made of his doctrine; and the work of Ludwig Wittgenstein, whose pragmatic understanding of language as a form of action, and whose understanding of meaning in terms of the operations that follow from the grasp of the meaning of the word; and his interest in this process of seeing as, which I mentioned earlier, that were so central to his work. Wittgenstein, I think; and the early Piaget. - not what the teachers have made of Piaget, but Piaget as Eleanor Duckworth once said: What I want my students to do is not learn Piaget, but become Piaget. The ability to observe infants, to observe children, to construct hypotheses of What's going on there? What sense is being made? And to test that sense through on-the-spot experiments. And the Russian school: Vygotsky and Luria, whom I've quoted a little bit before; and their modern counterparts, Scribner and Michael Cole (1974). These are the sort of people that I've been thinking about. And the philosopher Michael Polanyi (1969). So it isn't as though there's nobody out there, you know, it's just that the power, the epistemological pull, of the modern research university and its associated institutions, including the elementary schools, is so very critical.
Question 4

I'd like to ask a question connected to what you called institutional blindness. Here in Victoria, as you're probably aware, we have, as I see it at any rate, a kind of Thatcherite change in Education, where we've only just recently brought in the competencies testing of children, the performance appraisal of teachers, and in the TAFE sector, a focus on getting students in at all costs; and a climate of considerable fear amongst teachers as to whether, if they don't pass students, they might get into trouble; couple that with a considerable increase in class sizes; and as well as that, competition between schools to attract students by advertising, and so forth; problematical futures for working class district schools, and a refocusing of the nature of education into training, rather than education directed to preparation for real work; And then, just to conclude, ten to twelve thousand teachers having 'taken the package', some of them unwillingly, [Prof. Schön; Taking the package means retiring? Audience: Yes, retiring before their time.] but just feeling that they can just do no more. So all of that adds up to a very worrying future, in my mind, for Education. And there seems to be a focus more on this systematic, molecular type of approach to Education. Perhaps you could comment on what we could do about that. I think it needs to be aired.

Prof. Schön: I think you made a wonderful inventory of deadly sins. So now we should start thinking about individual practice and knowledge and learning through institutional change and policy change. We in the United States are currently in the throes of very serious efforts at institutional reform, educational reform. In my lifetime it's the second coming. The first coming was in the 60s when we embarked on educational reform in response to the external threat of Sputnik. We had to educate our students better, especially in science and math, in order to combat the Russians. Now we are anxious again because of the Japanese business competition. We seem to need an external threat. But we are going through a series of rather intensive experiments at the individual school level, at the district level, at the State level, at the national level. And without trying to answer your question on one leg as to how to go, I think one issue that certainly comes through clearly is that it's a very complex problem and one wants to tackle it in a multidimensional way. Right?
So, you would like, for example, to see the space of the school change. Because ordinary classrooms with seats in rows rigidly arranged, or classrooms with too many students in them, can make it extremely difficult to teach in the way I have been describing. We'd like to have teachers have greater autonomy, more freedom to figure out how they teach against performance criteria that were understandable. You would like to, as this gentleman up here said earlier, be able to promote collectives, groups of teachers who could think together about their work and become organisational units, become change-oriented teams. You'd like to provide an incentive system that would reward that sort of behaviour. You would like to give individual schools greater autonomy in relation to district policy. You'd like to provide better forms of teacher preparation. You would like to make a stronger bond between the individual teacher and families of kids. I don't know what the issues of minority education here are, but in our cities a critical issues is the lack of adults who care about what happens to kids. So I could go on and on. When I'd gone on far enough I'd have painted a picture which is impossible: it falls under its own weight because it's so comprehensive, it's so complex, so much needs to be done.

But there is a wonderful man whom you should know about, who name is Albert Hirschman (1970, 1971). Not many people know about this institutional economist and specialist in economic development. He wrote a number of important books, one of them was called A Bias for Hope, which gives you some feeling for it. Another was called Exit Points of Loyalty. But in the late 50s he developed an approach to economic development through his work in Latin America which he called imbalanced growth: uneven development. And he was arguing against the people who were calling for a big push: that you have to do everything at once. I don't know if you remember, but in the 50s it was very popular in the economic world to argue that where one had vicious cycles of poverty, one had to do everything at once. That was the theory of Walt Rostow and a number of others. And Hirschman argued that, 'No, that's not true'. What you need to do is make interventions which have the property that they entrain other interventions. You have to make changes that create demands, which call for other changes. So for example, to create a group in the 4th Grade who are addressing the teaching of math in a different way can bring together the math teachers in a school to think about the teaching of math. This can generate demands on the part of those math teachers for a different structure in how to teach
math, for example, how many hours should be given to math. The approach of drawing together a group of teachers in a school to think differently about how they work with kids can have the effect of creating a pressure group within the school to rethink the use of time during the day. And my own experience is that schools which have developed well, have often developed in that way. In the United States there's a very good school called Central Park East in the toughest district of New York, which is Harlem, developed by a woman named Debbie Myer. And over a period of about 12 years, piece by piece, she as Principal of the school was able to create quite an extraordinary educational setting. I think very congruent with what I have been describing here. Not all at once, but chunk by chunk. And working with the issues that were both pedagogical and political as she went.

So starting with your list of venial sins, I think the issue becomes, 'Well, who are you?' I have to think about my own role: Who am I? What's my platform? How can I act? If I address the question at 30,000 feet, I can't do anything. But if I begin to consider my own role and my own situation, and my basis for action, then I begin to open up the possibilities of my own freedom of action. Now, I don't mean to minimise the conditions that you've just spelled out — and it may be, you know, that you're right in your basic pessimistic implication — but I would argue that we have a tendency to underestimate our own freedoms of choice. Now I can't know that that's true — I can see you shaking your head — and you may well be right.

Questioner: I'm researching teachers who've taken the package [accepted forced retirement].

Prof. Schön: You're researching teachers who've tried to make change. It would be interesting to see how they went about trying to make change and what happened to them. Then it would be interesting to ask, What could we do that would be likely to change those outcomes? What would it take to change that outcome? What actions could we take? I don't mean in a few words to dispel your well-earned pessimism. If that's what you've earned, you're entitled to it.
Question 5

I really am looking for some affirmation about some of the things I've been teaching that are related to your work. My students are adults. In this last semester when I've been talking to them about reflection-in-action — they come from training and development areas — your sequence of knowing-in-action and knowledge-in-action, of doing something routinely within their field of endeavour, and then getting a surprise, and then reflecting-in-action. In solving the problem, they are creating for themselves new knowledge. And my students are giving examples that are very basic, things that they should know as part of the mastery of their profession, compared with your reference to the people excelling within the practice. I just need assurance that in creating knowledge for themselves, that knowledge might well have been created within the profession, but it's a legitimate form of knowledge for their sense of discovery, as well as the bigger picture of knowledge. Could you comment?

Prof. Schön: I think I understand, but I'm not entirely sure I understand what you are saying. If you're attributing to me the notion that people already need to reinvent knowledge that already exists, I don't think so. On the other hand, if knowledge already exists within the profession, what does it mean for me to get hold of it? For example, at MIT where I work we have undergraduate engineers. It's supposed to be the best school of engineering in the world, and yet I have a colleague who just finished his PhD on how undergraduate engineers in mechanical engineering design. It turns out that these engineering students, who have passed the basic courses in Mechanics and in Physics and in Statics, don't know how a lever really works in a machine. And the proof that they don't know it is that - you know, that a lever, like a see-saw makes defines an curve as an arc, right? The proof is that when they design, for example, a configuration, they won't design it in the light of that arc. They'll produce something that looks like a lever but doesn't have the operating conditions for a lever. So I think what that does is it raises the issue of what it means to get the knowledge that the field knows. And the process by which you get it is very akin to the process by which it was invented. You see you have to try to get it, you have to discover the puzzles and surprises that come when you try to "apply" it and then you often find that 'I know the equation, but I don't get it'. That's what students say: 'I learned the formula, but I didn't get it'. Because there's a different sort of understanding of, in this case, the behaviour of structures, which they need to get.
The other thing is that in a paradoxical way, I think it's quite compatible to marry rote learning and reflection-in-action. For example my 6th Grade son - who's now 39 – when he was in the 6th Grade he had a teacher, Mrs Saint Pierre, made the kids learn Greek and Latin roots of words. They had to memorise fifty roots. But, when they'd memorised these roots, they could then look at a strange word which they didn't understand and they could form a hypothesis about the meaning of the word. And that became very exciting; and they could test the hypothesis. They couldn't have done that had they not memorised the roots.

Okay. Thank you very much.

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