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Empowerment teaching: A 7-Phase Model to secure an effective international Knowledge Transfer in Applied Sciences

Prof. Dr. Jürgen Kretschmann,
President, TH Georg Agricola University, Bochum, Germany
juergen.kretschmann@thga.de

ABSTRACT

International knowledge transfer is the basis to reaching jointly scientific excellence all around the world. But: How can we transfer our knowledge effectively from country A to country B? What are the prerequisites especially in applied sciences like engineering?

Having given numerous lectures around the world during the last fifteen years the author is convinced that participatory training methods can be an ideal answer to this question. The main aim is to empower the learner to meet the challenges of the future in theory and in practice. Participatory training methods enable the learner to develop skills, knowledge, and attitudes. They are very useful to overcome cultural barriers between the lecturer and their students. This can create a win-win situation for both sides.

The authors have developed a 7-phase model based on their practical teaching experiences which can be applied to secure the effectiveness of an international knowledge transfer.

Keywords: knowledge transfer, participatory training methods, 7-phase model

INTERNATIONAL EXCELLENCE THROUGH KNOWLEDGE TRANSFER

Around the world, an excellent education is believed to be the key precondition for individual wealth, economic prosperity, and environmental protection. Therefore, our world should be in excellent shape since ninety percent of all scientists who have ever lived are living today; the largest number of scientists in a generation of all time (Kretschmann/Plien 2014). Nevertheless, how can we apply a successful international knowledge transfer as knowledge is created in such an immense amount? As today knowledge is mostly published through the internet and high-ranked journals in a one-way street of knowledge transfer. But one-way communication alone is not enough to secure long-lasting effects on science, society and, politics (Kretschmann 1990).

In emerging countries, the potential of highly motivated young academics is diminished by a lack of ability to apply this knowledge. Therefore, it is essential to implement capacity building measures to promote and accelerate the transfer of knowledge and technologies from developed countries to emerging countries. Expertise from abroad can bring knowledge and motivation to these countries, but the main focus has to be the building and development of local academic expertise. A key element to this merging process is the cooperation between universities from different countries. On a face-to-face level the scientific community can try to motivate and enhance the capacities of the highly

qualified academic talents in the emerging countries. By exchanging the acquired knowledge and transferring personal expertise of senior researchers and highly experienced executives from developed countries, knowledge will be accessible and easy to process for future researchers, managers and leaders in emerging countries (Kretschmann/Plien 2014).

Participatory Teaching Methods for Knowledge Transfer

In conventional lectures the teacher defines what is to be taught and the methods to be used (PRIA 2002). This also corresponds to a strongly deductive teaching style which Felder and Silvermann (1988) describe as the prevailing method where teaching starts with principles and "fundamentals" (Felder and Silvermann 1988: 677) and only later proceed to the applications. This approach of lectures is traditionally based on the idea that the lecturer knows everything, while the students know nothing (deficit orientation). The lecturer defines the particular set of what students need to learn and how these learning needs can be met. Students do not have any active roles during this process. The lecturer becomes the central point, around whom the entire process revolves. In applied sciences, this method cannot be regarded as state-of-the-art. The success of communication (teaching) depends on the listener not on the speaker. Because of this effective teaching requires a change of the lecturer´s role from being a mere sender of knowledge (teacher) to a coach, then to a motivator, and finally, to a mentor. Participatory training methods are based on an empowerment-orientated approach. They promote learner-centered development through training and learning. Participatory training methods help learners by enabling them to develop skills, knowledge and attitudes individually and to share perceptions so that they can actively contribute to renewal and improvement (Nguyen 2011). They aim to increase the potential of the learner (potential orientation). Empowerment teaching thus boosts confidence of learners which impacts on motivation of learners (Graham et al. 2013).

In practice, active application of participatory teaching methods also implies a change of perspective for the lecturer as the seats are arranged in a semi-circle or circle to create a closer contact between participants and the lecturer (Paukens et al. 2008). Regarding training materials, diverse tools and other materials such as white board, moderator box and contents, sheets of AO paper (flipcharts), notebooks, projector and screen, etc. can be used. Beside of this lecturer should use materials such as photos from incidence in practice or/and video clips to visualize the theoretical inputs (Kretschmann/Nguyen 2014). This will help students to remember the detailed information, more than only listening to the trainers, or reading documents or books (Kretschmann 2000). Additionally, posters, related statistical data, and charts can contribute to a better understanding (Kretschmann/Nguyen 2014). Most important, however, are lecturer's attitudes and mindsets of intelligence and abilities: studies have shown that an open, non-fixed belief about intelligence may influence students' performances in exams (Canning et al. 2019), their persistency in college and students' motivation (Canning et al. 2019, Rattan et al. 2012).

Moreover, lecturers' attitudes and mindsets may also convey and facilitate a sense of belonging to engineering applied sciences (Rattan et al. 2018, Killpack & Mélon 2016) as this may be an important factor to further pursue this field academically or professionally (Hrabowski 2011; Wilson et al. 2015).

If participatory training methods are applied during the training programs the lecturer can motivate and mentor the learners´ initiative roles in learning, and encourage them to contribute more at work; such as finding out disadvantages and how to improve the situation themselves. Learners should understand that the details can be seen in work place by the directly involved staff, not by the management board. Participatory training methods promote learner-centered development through training and learning. Therefore, the training should be multi-sectoral, interactive and focused on group work. Participatory training is learner-centered as it recognizes, evaluates and seeks to build on the existing knowledge of the learners.

7-PHASE MODEL FOR AN EFFECTIVE INTERNATIONAL KNOWLEDGE TRANSFER

During multiple training courses the author has developed a 7-phase model for an effective international knowledge transfer from developed countries to emerging countries with an emphasis on the education in the mining sector.

1. Start-up Phase

At the beginning of the first seminar it is important to establish a common basis. The lecturer has to explain the framework and the rules they expect to be followed in the course of the lecture. It must be kept in mind that learning is set within a frame which incorporates many cultural differences (Hofstede 1986). Most importantly, knowledge cannot be transferred when teacher and student do not speak the same language. One language, mostly English, has to be defined as the classroom language. A strict application of this rule has to be enforced in order to keep everyone on the same knowledge level if students are coming form different countries.

After formal aspects of the training course have been defined by the lecturer, the participants should be asked to introduce themselves, sharing briefly their experiences and expectations of the content of the lecture. The aim of this first short introductions sequence is to overcome students´ hesitancy to speak. To make students talk is a first step to empowerment. The lecturer and the students get to know each other and facilitate the knowledge transfer by creating a friendly and cooperative atmosphere. Cultural characteristics have to be acknowledged. In Asian countries for example, it is important to overcome the hesitancy of mentioning the ego (I – myself) as a performance of politeness and the reluctant of showing the individual and preference of the group. Due to the high respect for older people and lecturers it will always be a challenge for the lecturer to implement participatory training methods, which emphasize individuality and flat hierarchies. A side effect of the short introduction by the students is that the lecturer familiarizes themselves with the names of the participants. This is especially challenging when dealing with names from completely unfamiliar cultural contexts. But in order to generate a friendly learning atmosphere this task should to be completed by the lecturer as soon as possible.

During the whole training course it is imperative to welcome questions as this gives the students the chance to participate and actively contribute to the learning success of their fellow students.

2. Warm-up Phase

After the introduction it is necessary to quickly break the ice between lecturer and students!

At first the “big picture” of the lecture should be explained in simple comprehensive language as the lecturer cannot assess the languages skills of his class at this point of the course. If possible the building of an emotional bond based on trust and sympathy should start right now. The warm-up phase has to be regarded as a core element of the 7-phase model as communication has a social dimension and is therefore the result of the interactive behavior between the lecturer and the learners (based on their culture and experiences). In the process of an active knowledge transfer two levels of teaching are present. On the content level the objective information is emitted but on the process and relationship level sympathies, emotions, expectations and fears are transferred in the way people speak to each other. Communicative relationships – like the ones between lecturer and student – are influenced predominantly by emotional feelings and only to a much lesser extent by rationality (Schulz von Thun 2015).

Lecturers and students should understand each other on the content level and on the relationship level. That is why during this phase the lecturer should evaluate potential barriers like shyness, restraint and poor language skills in order to further adapt the course. In this process the role of the lecturer as a team leader with their social competences and emotional and social intelligence is crucial for the success of his lecture. The lecturer should try to enforce the students´ willingness and abilities. Moreover, consoling or comforting struggling students is not helpful but tends to demotivate students as Rattan et al. (2012) have found regarding students’ math abilities. Instead, an open mind of the students’ ability to grow and develop may essentially make a difference. Though a main aim of the lecturer should be to motivate the students to talk and listen – it is their task to be the best listener in class. Student’s acknowledgments of the learning progress should be given and contributions in classroom should be valued. In this way students will feel optimistic about their abilities to learn, enhance creativity and decision-making skills which keep the intrinsic motivation high and leads to a better learning effort.

3. Learning and Experiencing Phase

Phase 3 initiates the learning and experiencing process of the students and enables the learner to develop their potentials, skills, knowledge and attitudes. Central are methods which are often labelled as “active learning” as they engage students in the learning process, by “actively processing and

applying information in a variety of ways" (Wieman 2014: 8319) and thereby prompting students to "think about what they are doing" (Prince 2004: 223). This may include many different teaching methods such as collaborative learning in small groups, cooperative learning between individuals and longer phases of problem-based learning (Prince 2004), which have been found to positively influence student performance in general and in science, technology, engineering and mathematics in particular. Freeman et al. 2014 studied the impact of active learning on student performance and found that average exam scores improved by 6% while students in classes with active learning were less likely to fail. The teaching methods have to be outlined and explained to the students comprehensively. Time should be given to the students as they probably do not know the new teaching methods that will be applied during the course.

The course has to be designed by distributing learning in intervals, there has to be enough time for discussions and repetitions. For the long-term learning effect it is essential that the students have the opportunities to make their own experiences by guessing, trying, and speculating on new ideas and techniques. While transferring knowledge and applying this new method of teaching the trainer has to constantly encourage the students to actively use the classroom language.

In the theoretical inputs sessions, participants should share their own ideas and experiences. When learners get used to speaking out loud, they gain self-confidence to contribute more (Kretschmann/Nguyen 2014). The lecturer leads by setting the framework and planning the learning process. He acts as a moderator when the students provide their own ideas, knowledge and techniques. He helps the learners to understand the content of the lectures leading Q&A sections and discussions (Nguyen 2011).

Keeping in mind different learning styles (Hawk et al. 2007) as well teaching styles especially in engineering education (Felder & Silverman 1988), lecturers use different approaches to engage the students and enhance the active pursuit of new knowledge. It is also important to acknowledge Felder & Silverman's (1988: 680) assessment, that most engineering students prefer visual, sensing and active learning styles, whereas most engineering education is auditory, abstract and passive. A different teaching approach as it is advocated here may therefore enhance student performance and students' motivation. Theoretical input sessions should be systematic, scientific, updated, and realistic. The systemization of knowledge and techniques helps participants better obtain new knowledge and skills. The scientific features are illustrated by up-to-date achievements, can become persuasive evidence to the students. Students are free to contribute to the achievement of the group and ask questions to get a better understanding of the practical relevance of the theoretical input. The lecturer should play the role of a motivator and a mentor when facilitating and supporting participants' knowledge development (Koki 1997). Participants can exchange experiences, share reactions and observations, reflect upon implications and consequences, and discuss theoretical input with responsible people in practice. Subsequently students can develop practical and conceptual understanding (PRIA 2002).

The main goal during this phase should be that the students are eager to come to class and learn as they have been inspired by the transmitted new ideas and learning processes. Due to the possibility to contribute to class in a two-way-learning-process (which increased their acting competence) a trust and belief in their competencies is enhanced more and more which contributes to an increasing self-efficacy and self-esteem. This could also impact on the students' belief of intelligence and abilities – studies have shown that students' fixed growth mindsets (fixed abilities and intelligence) are predictors of their academic performance (Blackwell et al. 2007).

4. Practical Phase

In general, people remember about:

- 10% of what they read
- 20% of what they hear
- 30% of what they see, but
- 50% of what they see and hear

- 80% of what they say or write
- 90% of what they compile and execute themselves (Kretschmann/Plien 2014).

The aim of the practical phase is to learn with all senses. Learning is often not done with the head alone, but with the hands (touching), the heart (emotions), the skin (heat, coldness) and sometimes with the whole body (very strenuous work). Therefore it is important that theoretical input sessions are accompanied by field trips, practical sessions or discussions with people in practice. In applied sciences knowledge should not be generated and transferred in small academic circles, but should be used to improve the outside world. Therefore, the theoretical input has to be transferred into real life to make the world a better place by realizing improvements. Applied science is based on every day's challenges everybody has to face everywhere around the world, big challenges like climate change, deforestation or conserving the global fresh water supply; as well as other smaller problems like implementing safe working conditions in coal mines. Therefore, a sustainable understanding should be transferred to the students that every challenge is important and every question should be addressed. Teaching applied science should make the students able and willing to use their knowledge for improvements.

The practical phase has to imprint the fact that engineering is an applied science. In order to achieve this, students must be given space to realize self-effectiveness and competence. The lecturer has to foster acting competence in practice. He should encourage teamwork and demand students' contribution by actively asking questions, sharing experiences and observations, reflect implications and consequences and leading the discussion with people in industry. To sum this up the students must test themselves in order to become future researchers, decision-makers and team players. Sometimes best cases or role models can be adapted and implemented. But, applied science in the real world usually does not carry out one-size-fits-all-solutions. To solve the challenges of a real case and apply suitable solutions should be the focus of this phase. That is why the lecturer should set the goals and rules, give orientation and lead the learning process! Most importantly they have to create a positive learning atmosphere with the aspiration in mind – yes, we apply! The learners should be aware they are not learning for their exam primarily, but for their and others´ future lives.

5. Wellness Phase

Courses designed as block seminars with additional field trips can enhance the learning process of the students tremendously when the lecturer designs a friendly and creative atmosphere outside the classroom as well. Planned distraction like trips to cultural sites or even touristic places will first of all shape the group cohesion and support the creation of a student network, which is especially important if students in the courses come from different countries and universities. These extracurricular activities help to overcome cultural barriers between the lecturer and the students and among the students themselves. Enjoying free time transports joined positive experiences into the classroom. The aim is that the lecturer creates "happy moments" (and hundreds of photos by the learners) to show the learners that lecturers can be good company. The learners sometimes will remember these happy moments for the rest of their lives.

6. Exam Phase

A lecturer has to actively let his students apply their knowledge during this phase that will summarize the learning efforts of the students. In the course of the exam the lecturer has to be the mentor and coach who encourages the students to transfer their knowledge learned by the participatory teaching methods back to the audience in form of the audit committee. By creating a positive and challenging atmosphere the lecturer should guide the student through the exam. It is imperative to be fair and avoid surprises by asking questions out of the transferred knowledge curricula. Handwritten papers might be allowed to support the student in the exam. It has to be made clear beforehand that the amount of personal notes should be kept to a manageable limit.

7. Final Phase

After the exams are completed the final phase concludes the course. The importance of this phase should not be underestimated as it will have a long-lasting impact on the students. As they have hopefully all passed the exams, all students should be asked to (anonymously) evaluate the course. Student evaluation of teaching (SET) is an acknowledged instrument of evaluating teaching effectiveness in institutions of higher education worldwide (Spooren et al. 2013). Though there might

be problems applying this instrument it can give valuable insights into students' reception to further refine and develop the lectures (Gezign 2011). Giving meaningful feedback is also a strong motivation for students' participation in teaching evaluations (Chen & Hoshower 2003) thus taking students' opinions and feedback may also strengthen the relationship between lecturer and students.

Overall, it is the final and most important task for the lecturer to encourage the students to be proud of themselves. In order to strengthen the emotional bond and build a trustful and long-lasting future relationship the class and staff of the institution which supported the course could jointly celebrate the end of the course, for example during a dinner. A handwritten invitation is a very polite way to say "Thank you" for the time shared and the knowledge that was transferred. This will close the whole course in an appropriate way. It will probably be done by the students intuitive but the lecturer should not forget to take photos to value the time he or she has shared with their students.

CONCLUSION

Potential orientated participatory teaching methods can improve the effectiveness of an international knowledge transfer. The following equation summarizes the authors' vision of such a transfer:

$a + 2h = c$

a = I am (a valuable person, lovely, nice, competent, unique characteristic, individual, somebody special, human)

h= I have (knowledge, aims, competencies) I have (friends, a team who will help, people who like me)

c = I can (apply my knowledge, solve problems, bear burden, meet challenges, undertake responsibilities, …)

When implementing this equation by using participatory teaching methods lecturers will realize the tremendous learning effort of their students as the biggest advantages of this method compared with the classical "top-down teaching." If international lecturers insist on playing the center role in the class/seminar room, transfer of knowledge might be possible, but it is not as effective as possible and denies cultural barriers that might exist. Lecturers should therefore give the participants the initiative in learning, sharing and applying their knowledge playing the roles of the coach, motivator and mentor. If lecturers want to teach successfully all over the world, they need excellent language skills, high motivation, humanity, respect, excellent time management, huge emotional engagement and a great passion to their profession. Participatory teaching methods applied effectively can overcome cultural barriers and create win-win situations for both, lecturers and students. This experience will enrich their lives and bring them joy and happiness!

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BIOGRAPHY

Since 2006 Prof. Dr. Jürgen Kretschmann is President of the TH Georg Agricola University and CEO of DMT-LB mbH. Since 2005, he is External Professor at the RWTH Aachen University. In 2018, he become President of the Society of Mining Professors (SOMP). From 1990 to 2001, he held different Management positions in the German Hard Coal Mining Industry (RAG Group) and he was CFO of the Managing Board of RAG BILDUNG GmbH from 2001 to 2006. His research focus is on Sustainable Resources Management, Mining Management and Risk Management.