

A study of teachers' reflections on teaching and learning

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INTRODUCTION

According to Schön [1] professional knowledge is to a high degree based on tacit knowledge. For university teachers, tacit knowledge includes knowledge about what works – and what does not work - when teaching a specific class of students a specific subject in a specific context. However, it is important to make tacit knowledge explicit for at least two reasons: Firstly, for the individual teacher it may support a more conscious linking of observations and experiences from own teaching practice to general principles of teaching and learning. This linking could enable a systematic analysis and development of own teaching in order to improve student learning [2]. Secondly, it is also beneficial to make one's tacit knowledge explicit in order to discuss teaching and learning with other persons, e.g. during peer coaching of less experienced colleagues, or collaboration on teaching development with colleagues. This unfortunately seldom takes place and leaves teachers in a limbo of solidarity. Therefore, the authors have developed a board game for university teachers to articulate and share their reflections on teaching and learning in a collective process. The game consists of a board and a deck of cards, where each card contains a

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statement related to teaching and/or learning. The purposes of the game are to support a team-oriented approach to teaching and thereby to strengthen communities of teaching practices [3], i.e. to develop groups of colleagues, who acknowledge the individual team members' different ways of teaching and how a manifold of teaching practices fertilises the students' building of skills, competences and attitudes towards becoming professional engineers.

The game has been played at two international engineering education conferences, at an annual education day at a university abroad, and at several faculty meetings at the authors' university. Data have been collected on the selection and ranking of cards. These represent the players' reflections on teaching practices and learning, and on consensus reached within groups of players – reflections which influence and are influenced by teaching practice. This paper documents an explorative study of the players' reflections on teaching and learning based on the selected and ranked cards. In this first study the data has been analysed focusing on the following two questions: What kinds of attitudes towards teaching and learning do the selected cards represent? And which cards are selected most often?

1 RELATED WORK

A well-known means for the individual teacher to make tacit knowledge regarding teaching and learning explicit and to develop a reflective approach towards teaching is to create a teaching portfolio [4]. A teaching portfolio typically consists of a statement of philosophy of teaching, elaborated examples of teaching practices, and a list of completed courses in university teaching and pedagogy [5]. For many university teachers it is not straightforward to write a statement on their philosophy of teaching. Chism [6] writes, *"For action-oriented individuals, the request to write down one's philosophy is not only mildly irritating, but causes some anxiety about where to begin."*, and Chism proposes among others dialogue with colleagues to help stimulate ideas for formulating one's own statement. One way to facilitate a constructive and equal dialogue between colleagues, where some are more experienced than others, is in a game like setting.

Beatty et al. [7] propose, *"a reflective card-sort exercise that helps surface the philosophical roots of personal teaching philosophies and helps teachers create or renew a teaching philosophy statement."* During a game like session, which is carried out in small groups of teachers or individually each participant is given a deck of 82 teaching philosophy concepts cards to review. Examples of cards: "Critical thinking", "Learning by doing", and "Social critique". In the beginning each player imagines a positive teaching episode, *"when you felt your teaching truly touched your students – a time when you felt inspired."*, and a negative episode. Thereafter, the idea is that each participant selects cards that resonate with one's personal teaching beliefs. In a dialogue small groups of players explore themes among their selected cards to group cards into manageable clusters. In the last step of the session each participant begins to write a personal statement of teaching philosophy.

Meier and Thrane [8] have developed a game *Exploring my Teaching*. The purpose of the game is to help university teachers to formulate their teaching philosophy and identify their strengths and weaknesses. Each participant gets a game board and a deck of 41 cards. Examples of cards: "Promoting critical thinking", "Learning by reflection", "Learning as a social process", and "Social critique". The game board is A3 size, and divided into three areas: "Current teaching ideals" with room for six cards, "Cards I do not associate with" with room for two cards, and "Cards I am curious about" with room for three cards. In the

beginning each player imagines a positive and a negative teaching episode. Thereafter, the player selects the most relevant cards to place in the three areas. In a structured and facilitated dialogue, groups of two or three players explore each participant's selection of cards. Finally, each participant has to write one's own teaching philosophy in one sentence.

2 A DESCRIPTION OF THE GAME

2.1 The Teaching philosophy game

The *T-mind game* (Teachers' mind about teaching and learning) consists of a deck of cards, a game board and a score board. In order to have cards with real-life statements the authors asked colleagues around the university to submit statements about teaching, learning and students, which they have heard recently in the hallways or at the coffee maker. The authors assume that cards with authentic, real-life statements are easier to relate to for teachers in engineering education than more abstract terms like "Critical thinking" and "Social critique". Furthermore, the authors assume that cards with pre-printed statements will reduce potential conflicts between players because nobody has to stand by a personal statement. The authors compiled a deck of 51 numbered cards. Table 1 shows an illustrative subset of collected statements used in the T-mind game.

Table 1. An illustrative subset of collected statements used in the T-mind game

Card #	Text on card
1	When the students enter my course their pre-knowledge is insufficient
2	It can be difficult to create dialogue with the students in classroom teaching
3	It is important that students are not only motivated by the need to pass the exam
4	A lecturer must always be able to have a dialogue with students during a lecture
5	Without lecturing it is difficult to convey the spirit of a course
6	A short Danish textbook is better than a long American textbook
7	The students do not read the curriculum and they show up unprepared
8	My main task as a teacher is to facilitate the students' learning processes
9	The best students must achieve top mark
10	The entire curriculum must be covered in the lectures
11	I work for all students to pass the course
12	The students have to study part of the curriculum themselves
13	Lecturing is more important than giving feedback to students
14	Teaching should not take time from my research
19	It is important to switch between practical exercises and theoretical lectures
25	It's nice when the student asks deep questions that cannot be answered here and now
26	The students' personal development and building of technical knowledge happens in a mutual process
29	My teaching assistant must take care of the exercises. I take care of the lectures.
37	Let the students give each other feedback on their reports
39	It is only through group work that students learn professional teamwork
41	Learning is driven by curiosity
42	Humour is important to create a positive learning environment
51	The modern teaching methods are nonsense

The game board is designed as a red ring target in size A0, which suitable for a group of 4-6 players sitting around the board. On a score board the group makes a record of selected cards

2.2 Playing the game

In the beginning of a game each player gets a deck of cards, a few blank cards and is asked to consider: what is good teaching in the course you are involved in? Each player has to select the five most relevant cards to help answering the question. Players can use one or more blank cards to formulate their own statements. One by one the players put their five cards on the board in order of importance. The most important card is placed at the bull's-eye, and the least important at the perimeter. When placing the cards the player explains his/her selection and weighting of cards (individual reflection). When all players have placed their cards, the group makes a record of the selected cards and their relative importance on the score board. In the second round the group has to try to reach consensus as to what are the five most important cards to answer the question. The group are free to use all cards of a deck and to fill in blank cards. At the end of the round five cards have to be placed on the board and ranked with respect to importance (group consensus). The cards and their relative importance are recorded on the score board.

After the second round has finished each group present their group consensus for the other groups and obtained results are discussed. The purpose of the discussion is to support a team-oriented approach to teaching and thereby to build or strengthen a community of teaching practice.

If time allows a third and fourth round can be played with focus on the question: what is good teaching in the course you are involved in *seen the students' perspective*? The game is played in the same way as in the first two rounds, but focus shifts towards what enhances learning. Playing the third and fourth round can be a good base for a deeper reflection and discussion on what students and teachers find important for teaching and learning.

2.3 Inviting the students

An interesting option is to ask students to play T-mind. One way to do it could be to run two sessions in parallel, where students play in one session and teachers play in another. By the end of the sessions the students and teachers meet and present the obtained results. The results can be compared and differences made visual based on the cards chosen. In this way teachers will get an insight into what their students' find important for teaching and learning.

3 PRESENTATION AND INTERPRETATION OF DATA

The authors have facilitated game sessions and collected score boards at several occasions. In order to get insight into the players' reflections about teaching and learning the authors have classified the cards and developed a measure of how cards were selected.

The cards are classified according to Kugel's model of how professors develop as teachers [9]. The model describes the development in five stages. Kugel writes, *"Typically, when they being their teaching careers, professors focus their concern primarily on their own role in the classroom (stage 1: self). When they have mastered this role ... the focus of their concern shifts, first to their understanding of the subject matter they teach (stage 2: subject) and then to their students' ability to absorb what they have been taught (stage 3: student). With this shift comes a more general shift of focus from teaching to learning, that begins, in stage 3,*

with a focus on helping their students become more absorbent (stage 3: students as receptive). Concern then typically shifts to helping students learn to use what they have been taught (stage 4: student as active) and then to helping them to learn on their own (stage 5: students as independent).” In a dialogue the authors classified the 51 cards according to Kugel’s model. Thus the classification is based on our personal views. Two cards (no. 6 and 51) do not fit into Kugel’s model and are recorded as “no category”. Table 2 shows the classification.

Table 2. Cards classified according to Kugel’s model, [9]

No category	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
	Self	Subject	Students as receptive	Students as active	Students as independent
6,51	14, 22, 29	5, 10, 13,15, 16, 18, 24, 38, 50	1, 2, 3, 7, 9, 11, 21, 23, 27, 28, 30, 31, 34, 42, 43, 45, 49	4, 12, 17, 19, 20, 32, 33, 36, 44, 46, 47, 48	8, 25, 26, 35, 37, 39, 40, 41

The quantitative measure of how cards are selected is as follows. When a card is placed at the bull’s-eye it is assigned 2 points, the second card gets 1.75 point, the third 1.50 point, the fourth 1.25 point, and the fifth card placed at the perimeter gets 1.0 point. Cards which are not selected get 0 point. For each session the weighted sum of the cards was calculated.

In the following data are shown from five occasions: the CDIO 2016 conference (CDIO), the Education Day 2016 at University of Twente (Twente), a meeting for study leaders of B.Eng. educations at our university (Beng), the ETALEE 2017 conference (ETALEE), and a seminar for teachers on a B.Eng. education in healthcare technology (Health). Figure 1 shows the results from first game round (individual reflection). Figure 2 shows the results from second round (group consensus). Figure 3 shown results from third round (individual reflection on what is good teaching *seen in the students’ perspective*).

Figure 1 shows that most statements chosen by the players in the first round (individual reflection) were from stages 3, 4 and 5 of Kugel’s model [9]. Furthermore, the overall distribution of statements with respect to the stages (not the individual statements) seems uniform no matter where the game was played.

When comparing results obtained from individual reflection (Figure 1) with group consensus (Figure 2) a tendency to choose statements of higher stages is seen. The “tail” of statements from stage 1 and 2 does almost not exist in the group consensus. This deselection of statements from stage 1 and 2 indicates that during the group discussion players tend to lift their reflections towards the higher stages.

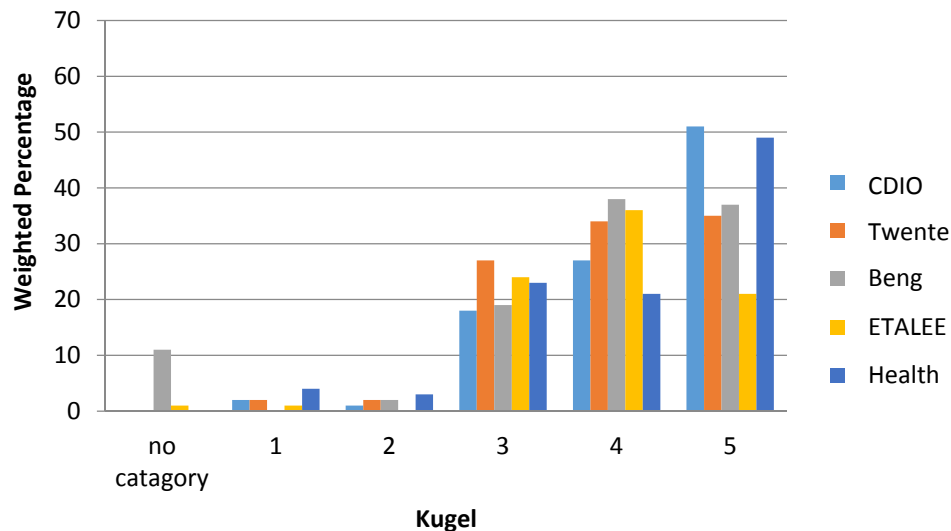


Figure 1. Results obtained for players' individual reflection according to Kugel stages. This part of the game was played at the CDIO 2016 conference (CDIO), at Education Day 2016 at University of Twente (Twente), at a meeting for study leaders of B.Eng. educations at our university (Beng), at the ETALEE 2017 conference (ETALEE), and at a seminar for teachers on a B.Eng. education in healthcare technology (Health).

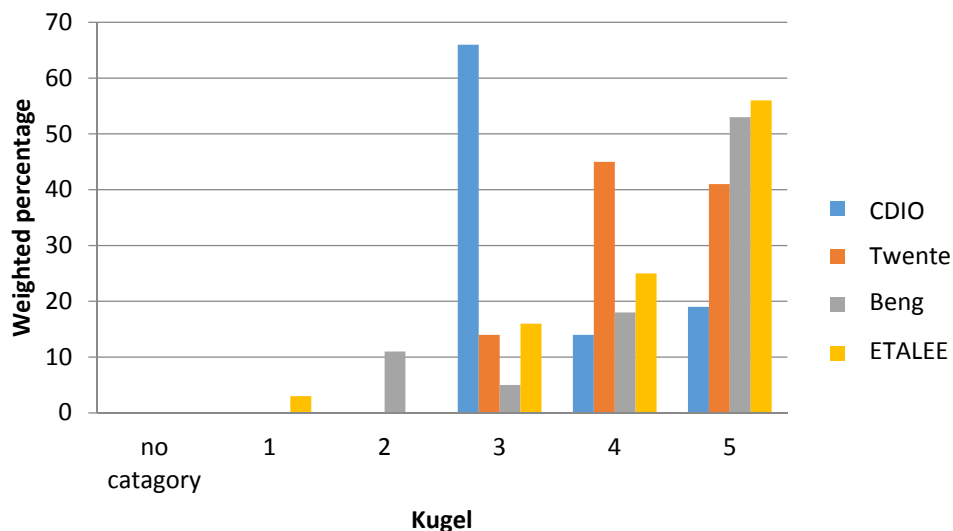


Figure 2. Results obtained for group consensus according to Kugel stages. This part of the game was played at four occasions, legend see Figure 1.

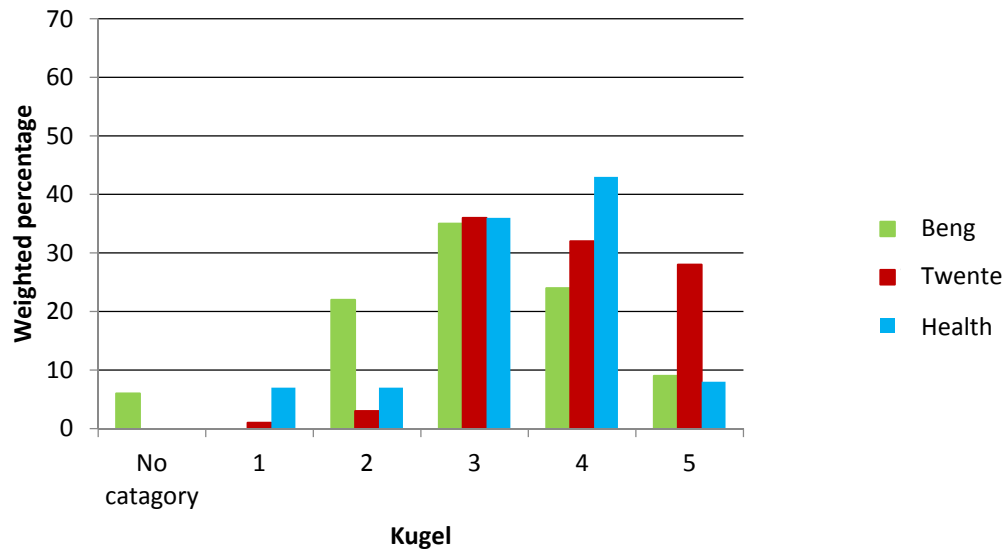


Figure 3. Results obtained for players' individual reflection on good teaching seen in the students' perspective according to Kugel stages. This part of the game was played at three occasions, legend see Figure 1.

When comparing results from round 1 (*Figure 1*) and round 3 (students' perspective) (*Figure 3*) we see that in the third round the players select most cards from stages 3 and 4. At the T-mind session in Twente a higher number of cards from stage 5 were selected compared to the two other occasions (Beng and Health). On *Figure 3* it is interesting to observe that the study leaders (Beng) select many more cards from stage 2 (Subject) than the teachers (Twente and Health). What could be the reason for a difference in perception of good teaching seen in the students' perspective between study leaders and teachers? The authors assume study leaders are more concerned about the students' progression from course to course and about overlap between courses than teachers. The study leaders' concern is mainly related to subjects being taught. Thus, when study leaders are in dialogue with students the focus is primarily on subject, whereas when teachers discuss their course with students not only subject, but also issues like number of exercises, types of assignments and feedback, examination and grading are at stake, and these issues relate to the students' activities (stage 3, 4, and 5).

Data shows that the five most repeatedly selected cards both in round 1 (individual reflection) and round 2 (group consensus) are the following: card 3 (stage 3) "It is important that students are not only motivated by the need to pass the exam", card 42 (stage 3) "Humour is important to create a positive learning environment", card 19 (stage 4) "It is important to switch between practical exercises and theoretical lectures", card 8 (stage 5) "My main task as a teacher is to facilitate the students' learning processes", and card 41 (stage 5) "Learning is driven by curiosity". This authors find this selection of cards very positive. These five statements stretch out a field of issues: student motivation, humour and curiosity, exercises and lectures, and facilitate learning, which are all relevant issues to consider towards the goal of good teaching and learning.

4 CONCLUSION

This paper documents a first explorative study of teachers' reflections on teaching and learning based on empirical data from playing T-mind. The study indicates that individual players tend to choose few cards with statements from Kugel stages 1 and 2 and most cards from stages 3, 4 and 5. Furthermore, the group consensus round lifts the players' thinking, as the lower level cards are deselected during the group discussion. Thus, playing the game seems to change the teachers' thinking in a positive way. This change of thinking does not ensure a changed behaviour of the teacher in the classroom, but it is a necessary condition for changed behaviour. Thus, it is concluded that the group-oriented, collective process in the T-mind game has potential for leading to better thinking and learning.

The outcome of the study prepares the ground for more and deeper studies. Through more game session more empirical data will be collected to analyse. It will be interesting to see if similar results will be found. It is also relevant to deepen the study by analysing the statements that participants have written on the blank cards. Finally, it will be interesting to organise sessions, where teachers and students play the game in parallel and to compare results.

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