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Kaizen in University Teaching: Continuous Course Improvement

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Purpose

The current evaluation standards in German higher education institutions (HEIs) do not often lead to measurable quality improvement. The purpose of this paper is to critically evaluate whether *Kaizen* can improve the quality of teaching. The presented concept illustrates the evaluation of each course unit to continuously encourage quality feedback from the learners and intensify the exchange with lecturers.

Design/methodology/approach

Action research is used to combine the continuous improvement philosophy of *Kaizen* with student course evaluations. A pilot study of the concept provides data from four course cycles to analyze learnings and setbacks.

Findings

Learners in the pilot courses welcomed the intense participation and allowed improvements to elements such as course concept, course material, presentation style, and content or detail selection. The participation rate declined during each term and was highly influenced by triggers like exam and grade relevance. *Kaizen* could successfully improve course quality, especially in the first two years of newly developed courses.

Research limitations/implications

The presented results have been collected from one course over four years in one institution. The next stage of research would be the application of the approach in other institutions to validate results and make potential adjustments to the concept, for example toward continuous learning.

Originality/value

Although course evaluation has become standard in German HEIs, most institutions only implement it once per term or year. This paper discusses a new approach to expedite the evaluation of teaching quality at the point of action (*Gemba*) to facilitate the short-term reactions of lecturers.

Keywords: *Continuous Improvement, Quality Management, Lean Six Sigma, Higher Education, Teaching, Evaluation*

1 Introduction

Quality management has become of increased importance for higher education institutions (HEIs) in recent years as educational rankings and accreditation standards continuously postulate appropriate procedures (Dill and Soo, 2005; Bryant, 2013). For business schools, the Association to Advance Collegiate Schools of Business (AACSB) has a long tradition of defining recognized quality requirements (Miles *et al.*, 2004; Hedin *et al.*, 2005). They demand “an overview of the structure of the school, its policies, and processes to ensure continuous improvement and accountability related to the school’s operations” (AACSB International, 2018, p. 13). Universities are also currently subject to intense international competition in the form of “league tables” such as the popular Times Higher Education World University Ranking (Marginson and van der Wende, 2007). This article focuses on teaching quality, which represents 30% of the Times ranking (Times Higher Education, 2018).

Initially developed in the manufacturing industry, quality management and process optimization methods such as Six Sigma and Lean Management (Womack *et al.*, 1991) later spread into the service and public sectors (Kollberg *et al.*, 2006; Pepper and Spedding, 2010; Sreedharan and Raju, 2016). A core element of Lean is the *Kaizen* philosophy, which aims to continuously improve the quality of processes (Womack and Jones, 2003). The application of Kaizen in higher education (HE) is only reported in a few case studies in the literature (Emiliani, 2004, 2005). This study describes an approach that applies Kaizen to course quality through the use of continuous evaluation.

The manner in which course evaluation actually improves course quality has been subject to research. An extensive study of more than 6,000 courses in 31 degree programs over a period of 13 years exposed an equal amount of positive and negative changes in evaluation results (Marsh and Hocevar, 1991). This result was even more surprising as the lecturers had been evaluated an average of 30 times, offering many opportunities for change. Further studies, amongst them analyses in German HEIs (Lang and Kersting, 2007), show comparable results (Kember *et al.*, 2002). One of the reasons for these unsatisfactory results is that lecturers often do not change their teaching methods, even if they generally assess teaching evaluations to be useful (Wachtel, 1998; Beran *et al.*, 2005). While departments and universities face the challenge of developing measures from student evaluations (Ballantyne *et al.*, 2000), this article will focus on single course quality and how it can be improved through the use of evaluation.

Since the European higher education system reform *Bologna* in 1999, course evaluation has been introduced in universities across Germany (Damian *et al.*, 2016). The main goals are the assurance and improvement of teaching quality, as well as feedback and course reflection from students. Current evaluation standards in Germany vary but also have some characteristics in common. The average HEI evaluates each course once per term or year (Peiffer *et al.*, 2015). This evaluation usually takes place near the end of the term to give the lecturers the opportunity to discuss the results together with the students.

This study changes main aspects of a typical student course evaluation to guide instructors away from the reluctance to change. The aim is to rapidly accelerate the period between receiving feedback and applying changes in teaching by implementing weekly evaluations (Becket and Brookes, 2006; Peiffer *et al.*, 2015). By continuously confronting lecturers and students with course quality, the timely and flexible testing and implementation of course detail changes will be encouraged. This article contributes to theory by transferring the concept of continuous improvement to the quality of university teaching. The inductive action research approach describes a theoretical concept of how to continuously evaluate course elements. This is illustrated by presenting a four-year study that applies, re-develops, and tests this concept. Therefore, the article answers the following research question:

Can the Kaizen philosophy be successfully applied to course quality in higher education institutions?

The article is structured as follows. First, the research background is summarized. After introducing Lean Six Sigma in higher education institutions, the topic of teaching quality is discussed, followed by the improvement philosophy of Kaizen. The third section introduces the action research case and presents the concept of the continuous course improvement approach. Sections four and five summarize and discuss the results of the pilot study, while limitations and an outlook are given in the last section.

2 Research Background

2.1 Lean Six Sigma in Higher Education Institutions

The basis and motivation for the continuous course improvement idea came from two courses about Six Sigma and Lean Management. Following the *practice what you preach* principle of Langstrand *et al.* (2014), the quality of teaching processes should be measured and increased in the same way that private companies evaluate for their service processes. Even though the courses had different emphases, a key construct in each was the use of the LSS approach to combine Lean and Six Sigma. The goal of LSS is to capitalize on the strengths of both approaches (Arnheiter and Maleyeff, 2005). Although rooted in the manufacturing industries, over the years they have also been adopted by the service sector (Bowen and Youngdahl, 1998; Ahlstrom, 2004; Swink and Jacobs, 2012).

Lean and Six Sigma in higher education are relatively rare research topics (Antony *et al.*, 2012; Cudney *et al.*, 2019; Sunder M. *et al.*, 2018). Danese *et al.* (2018) note that the public sector and the education sector are both rather under-researched fields. They also state that German publications about Lean in international journals are relatively scarce. Lean Thinking is rated to be especially useful in HEI processes (Balzer *et al.*, 2016). For example, the elimination of waste, a core element of Lean, can easily be transferred to education (Douglas *et al.*, 2015). A collection

of research articles has also recently been published regarding the use of LSS in HEIs (Antony *et al.*, 2012; Antony, 2014, 2015). They document practice-oriented research about typical challenges, methods, and readiness/success factors. Other research articles document the introduction of LSS programs in general or discuss the execution of projects in administration processes while focusing on non-academic activities (Koch, 2003; Hess and Benjamin, 2015). The research is still in the theory-building phase and is expected to grow in the future. However, the aspect of quality management in relation to teaching has only been moderately examined in these publications. In contrast, this article focuses on the quality management of teaching processes. LSS provides the basis for the approach, which also considers the key elements of student evaluation theory.

2.2 *What is Teaching Quality?*

Learning can be described as the process of creating knowledge (Kolb and Kolb, 2005; Kolb, 2015). But how should this process be optimally designed and how can its quality be measured? The ISO 9000 standards define quality as the “degree to which a set of inherent characteristics fulfils requirements” (International Standards Office, 2015). Educational quality cannot easily be measured by a single indicator; it is a multi-dimensional concept (Cheng and Tam, 1997). Cheng and Tam (1997) describe different models for educational quality; of these, the process model and the satisfaction model are most related to the operations management perspective of this study. Within the process area, most university rankings weight research higher than teaching, in contrast to the student-centered approach used by this article (Ramsden, 1991).

“Good teaching means seeing learning through the learner’s eyes” (Ramsden, 1998, p. 353). To follow this philosophy and find the right measures for quality, the voice of the customer must be analyzed (Hwang and Teo, 2001). One of the main obstacles for the application of this tool is the identification of the “customers” and their concrete requirements (Andreassen, 1994; Owlia and Aspinwall, 1997). Internal and external process stakeholders have to be considered (Elias, 2016) as they represent different views and measures for quality (Harvey and Green, 1993; Tam, 2001). Typical external stakeholders in higher education are funding authorities, state or national educational regulators, and professional or international ranking or accreditation associations (Patil and Codner, 2007; Paor, 2016). In teaching, internal stakeholders prevail with the students as primary “customers” (Blair and Valdez Noel, 2014; Sunder M and Antony, 2018). Elliott and Healy (2001) show that “student centeredness,” “instructional effectiveness,” and “campus climate” can impact student satisfaction. The first two elements are addressed in this article.

The teaching quality model adapted from Rindermann (2009) in figure 1 summarizes a number of factors that influence the teaching outcome. These factors can be categorized as characteristics of the student, the lecturer, and the course environment. For example, the skills and prior knowledge of students should affect the intensity with which the lecturer explains certain topics. The teaching model demonstrates the diversity of puzzle pieces which together form the learning process and

influence the outcome of teaching. These must be considered when evaluating teaching quality and designing outstanding university courses.

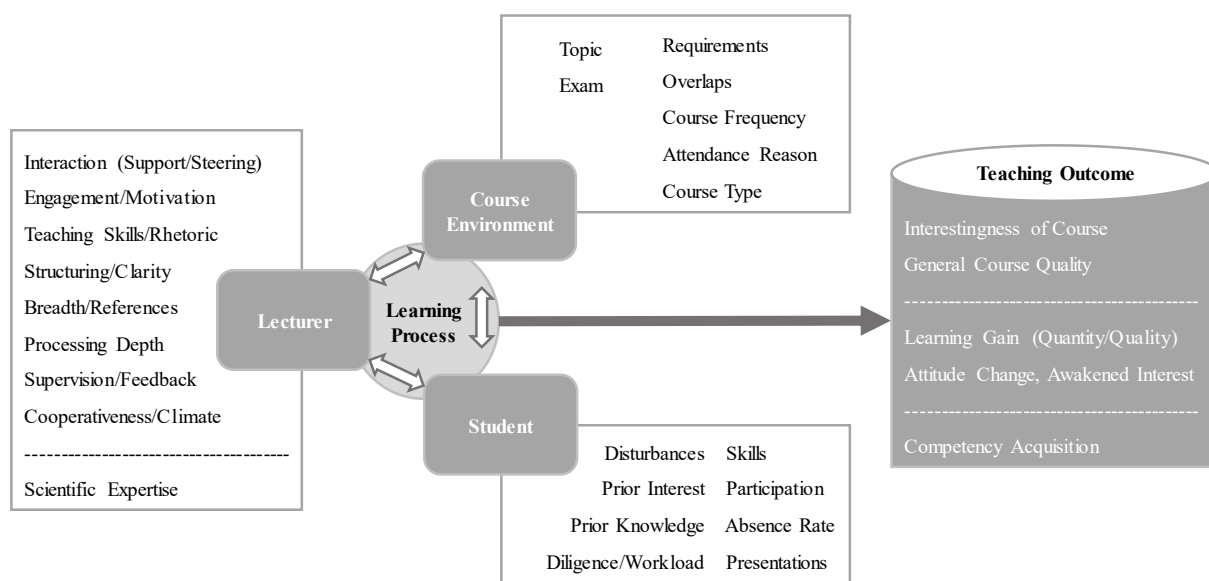


Figure 1. Multi factor model of course quality, translated and adapted from Rindermann (2009)

2.3 Improving Quality with Kaizen

The Kaizen philosophy is used to measure and change many of the presented indicators. Finding a sharp scientific definition for Kaizen is difficult, as it can be translated as a change to being good or better (Brunet and New, 2003). The Japanese organizational theorist Masaaki Imai (1986) coined the term as an overarching philosophy for the continuous, incremental improvement of all aspects of an organization (Doolen *et al.*, 2008). In the production industry, this philosophy encourages the shared awareness among employees to continuously reflect on their own activities and processes, as well as the overall context. The goal is to find ways for improvement, independent from hierarchical boundaries and the creation of improvement projects (Imai, 1986; Anderson and Rungtusanatham, 1994). The ways in which this policy of small steps on the operational level can also be applied to university teaching are presented in this article. One of the critical issues in achieving quality management and continuous improvements is to go to the “place where the action takes place” (Japanese “Gemba”) for processes analyses (Imai, 1992). Therefore, teaching quality can be evaluated best inside the classrooms.

The control and measurement of service quality is one of the core topics of service operations management (Machuca *et al.*, 2007). These concepts can also be adapted to higher education institutions. One of the most popular tools in service operations management is the SERVQUAL model, which is used to measure the performance of service processes. It has recently been adapted to evaluate how students experience university services (Marimon *et al.*, 2018) using a

comprehensive view that includes many satisfaction factors other than course quality. For the continuous course improvement in this article, customer-centricity is a crucial paradigm. A related approach, which considers students to be the customers of university processes, is presented by Douglas and Douglas (2006a). They adapt the operations management technique of mystery shopping (Harvey, 1998) to “mystery students.” These amateur auditors evaluate a large set of possible services, such as teaching, technical, recruitment, or administrative services. Practical problems include the question of recruiting real students rather than choosing more objective, but also conspicuous, external experts. The acceptance of feedback by the teaching staff is another critical point identified in many student feedback methods (Douglas and Douglas, 2006b). However, this article presents a concrete example of applying continuous improvement to courses using the anonymous student voice as feedback from the process customer.

3 Method

3.1 Pilot Study Action Research

This study used action research to describe and analyze a phenomenon while being involved and influencing its characteristics (Coughlan and Coghlan, 2002). Action research has been a popular research method in operations management since the 1990s (Westbrook, 1995). Instead of neutrally describing a case study or empirically testing a phenomenon, the approach supports research in practice and direct experimentation with changes in the processes and environment that are under research. The object of investigation in this article was the teaching quality of a university course. It has been studied following the action research cycle described by Susman and Evered (1978) and originating with Lewin (1946). Over four years, four research cycle runs have been used to adapt the research method as well as the teaching details for the course. The course curriculum and goals will be described in this section to provide an overview of the action research environment.

The concept of continuous course improvement was applied to a master's-level engineering management course in Six Sigma over four consecutive years with the author as the main lecturer. The students had previously studied at different universities, so their skill sets and prior knowledge varied significantly. Another reason for the use of continuous feedback was the diversity of applied teaching forms. These included lectures, guest speakers, group exercises, company visits, process simulation, and statistical software tutorials. The goals of the course included interaction with students and the increase of learning outcomes using a combination of classical teaching and problem-based learning methods following the advice of Piercy *et al.* (2012) and Tortorella and Cauchick-Miguel (2018).

The Six Sigma course was related to a Lean Management course. The courses could be taken independently, but the students who passed both exams received a certificate of *attendance* as a Six Sigma Green Belt training equivalent. Comparable training offered by external consultancies

in Germany cost approximately €3,000 to €5,000. This certificate was also a major benefit to the master's program. To receive a *full* Green Belt certificate, it was necessary to do more than simply pass the exams (International Standards Office, 2011). Students had the opportunity to work on a real LSS project in a company as part of their master's thesis. They were required to select their thesis position by themselves, although the faculty supported the identification of such projects through an established industry network (Kregel and Coners, 2018). The main lecturer for the course also provided supervision for the projects and carried out the tollgate inspections, thereby supervising and supporting the application of the theoretical knowledge of students in the real world.

3.2 Structure and Content of Continuous Course Improvement

Grounded in the Kaizen philosophy, evaluation feedback was used on an operative level and in short-term frequency. The students were encouraged to reflect on each course unit and provide feedback to the lecturer. This weekly evaluation could clarify difficulties in comprehension and could be used to customize parts of the course content to the participants. The lecturer encouraged the students to assess each unit using a web-based evaluation form in the days following each session. This method of feedback generation enabled the students to contribute input with their mobile phones; its anonymity also encouraged a high number of written comments (Spooren *et al.*, 2013). At the beginning of the next unit, the lecturer gave a short reflection statement summarizing the quantitative evaluation results and text annotations. It was important for the lecturer to regularly demonstrate the value of participation in the evaluation process. Also, if the lecturer disagreed with any statements, the summary provided the opportunity to explain their own point of view. Other input could be presented to influence the current course unit or that of the following weeks.

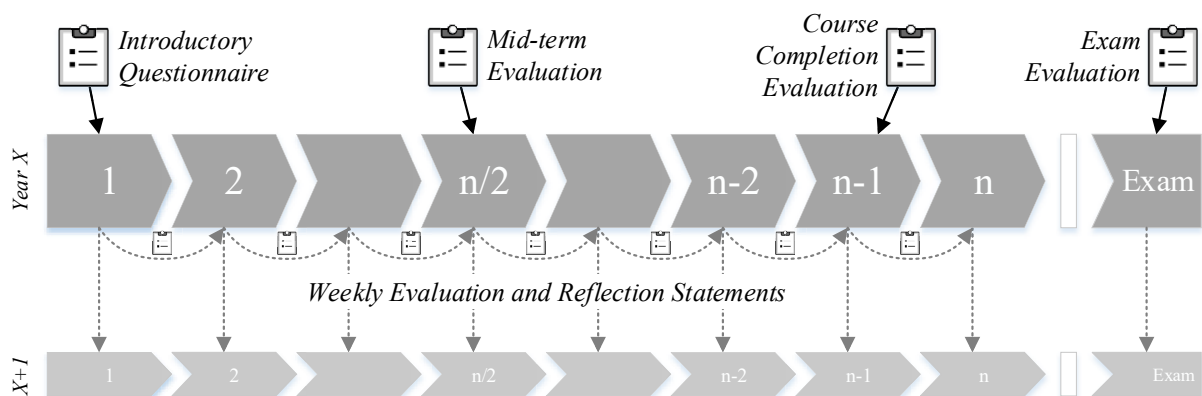


Figure 2. Evaluation points and types

In addition to this core element of continuous evaluation, some occasions during the term required special evaluation types, which can be found in figure 2. At the beginning of the term, a specific questionnaire gathered participant characteristics such as field of study and professional

background. Of primary importance were details about prior knowledge and skills related to the course topic. This fundamental information provided the opportunity to adjust details of the planned course in advance, even before taking the weekly evaluations into account. The course completion evaluation was equivalent to the method used regularly in German universities. In addition, the mid-term evaluation enabled the lecturer to gather general course feedback and change aspects of the second half of the course. Mid-term feedback has also been considered to significantly improve course quality (Diamond, 2004; Cook-Sather, 2009). These evaluation questionnaires should also be reflected upon in the presence of the students shortly after the point of evaluation. Finally, the exams were also evaluated, which was very new to German HEIs (Peiffer *et al.*, 2015). As the final exam was an element of the overall course, it was not left out of the evaluation structure.

The continuous course improvement concept relies on evaluation, a topic intensively researched in psychological literature. Several studies have analyzed the advantages and disadvantages of student evaluation. Dowell and Neal (1982) listed many critical and skeptical views of student evaluation. But they also stated that its validity might be improved in courses requiring more frequent feedback as students may find it easier to assess how much they learned compared to courses with little feedback (Dowell and Neal, 1982). Moore *et al.* (1996) identified teacher immediacy as an influence on student satisfaction with the learning process. Although direct verbal interaction and the availability of the lecturer remain important, the continuous evaluation method can offer an additional mode of communication between the lecturer and the students. When discussing student evaluations with other professors and lecturers, the validity of the students' opinions about course quality has occasionally been questioned. Some lecturers expected students to give positive evaluations to "easy" courses in which good grades may be achieved. Some even stated that negative evaluations resulted from demanding and challenging courses and could signify particularly high quality. In contrast, Aleamoni (1999) debunked the myth that the evaluation process could be "nothing more than a popularity contest."

As the student evaluation used surveys, method biases also had to be taken into account. A typical bias in this field is the non-response bias (Malhotra and Grover, 1998; Forza, 2002). As the majority of the students did not complete the questionnaire each week, the influence of this passivity had to be analyzed. The result of discussions with students in and after class showed that their main reasons for not responding were that their input had already been given in previous weeks, that they felt properly represented by the answers provided by other students, or that they did not like giving feedback.

4 Results of Continuous Evaluation

4.1 Example of a Weekly Evaluation Report

This section provides insight into an explanatory weekly evaluation report, after which a general summary about the four-year pilot study will be given. Figure 3 shows evaluation data from the third year of the pilot study. The goal of this report format is to summarize the evaluation results for one week on one page, following Toyota's A3 approach (Mohd Saad *et al.*, 2013). The unit for the relevant week included a 90-minute lecture about the methods and tools of Six Sigma's *DMAIC* analyze phase. After a lunch break, another 90 minutes were used for a Minitab software exercise in a computer lab. Out of 30 students, 10 participated in the weekly evaluation.

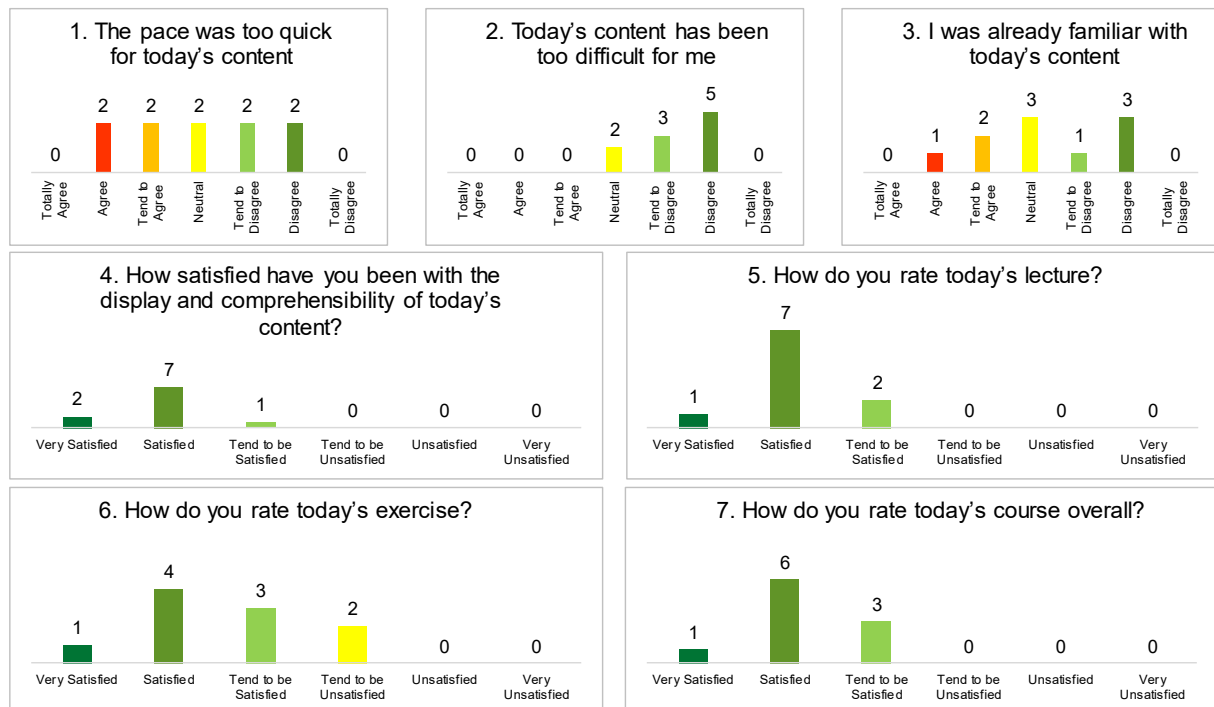


Figure 3. Weekly evaluation report chart

The evaluation data also included written comments from the students. At the beginning of the term, the lecturer announced that those comments would be made public if the students did not explicitly note not to include them. From time to time, a comment had to be anonymized, but most of them could be directly read and discussed in class. The example week was facilitated by a new lecturer who taught the first out of three weeks and covered the use of Minitab software in processing data statistics. The lecturer was a practitioner with expertise in LSS, project management, and industry knowledge. He also had experience conducting Green Belt training in companies, but not in universities. The main reason to work with him in this course was to transfer practical knowledge to the students and profit from his deep knowledge of Minitab. The following results showed that amongst other issues, the speed of his teaching needed to be discussed:

- “The speed of the exercise was way too fast to result in a learning effect. We learn too little by clicking once through several analysis tools without prior Minitab knowledge. To repeat the exercise at home, documentation would be helpful.”
- “A general comment: Why was a practical project included in the course ‘Automation Systems,’ but not in ‘Six Sigma’? In my opinion, it would be much more interesting, and more important, to work on a full Six Sigma project case study, including documentation. This would better impart and sustain the Minitab handling. I do not agree with the opinion that we could work on such a project during our master’s thesis. Like my grandmother said: ‘Practice makes perfect’ ;-).”
- “It would be really helpful for the Minitab exercise to know what the Minitab test will look like.”
- “In contrast to the lecture, the speed of today’s Six Sigma and Minitab exercise was too fast.”

The first comment is a good example of the kind of note that highlights areas in which more communication was needed. The standard documentation for Minitab was already accessible to all students, but this comment shows that not all students were aware of this. The second comment provides ideas about changing the structure of the course, or that of several courses in the curriculum. The use of Kaizen in teaching showed that the students were very curious about exam details. A good example is the third comment, which asked about the Minitab test. After the weekly evaluation, the lecturer and the course organizer discussed how future Minitab exercises could be designed with improvements regarding speed and comprehension. The evaluation results were also presented at the beginning of the following week to discuss consequences with the students.

4.2 Pilot Study Results

The weekly evaluation consisted of two parts. quantitative ratings of standard questions and additional text comments. As shown by the example in figure 3, the students rated their experience on a scale from *very unsatisfied* (-3) to *very satisfied* (+3). Their overall satisfaction varied in weekly values between +1.7 and +2.5, except for one week that included a statistical software exam (SigmaXL or Minitab) that significantly reduced the average value to +0.7. Grading and examinations seemed to be highly sensitive topics to students, resulting in a higher evaluation participation rate as well as significant increases in written comments.

After four years of continuous course improvement, typical patterns can be analyzed. All written comments have been coded and assigned to one of five categories, as shown in table 1. The two most popular types of comments were those relating to the content of the course (what is taught) and those regarding the lecturer and their teaching style (how it is taught). There were also comments about the structure of the course and its curriculum. Environmental condition comments included the provision of lecture slides and additional material. Finally, some comments also

discussed the weekly evaluation questionnaires. If a comment contained more than one aspect, the most suitable aspect was chosen.

On two days each year, companies were visited or representatives came to the campus to execute process simulation games. For these occasions, the participants of the Lean Management course joined the Six Sigma group. The number of participants in those evaluations was therefore significantly higher. In the summary table, these weeks have been noted separately to avoid falsifying the regular weekly data.

The course underwent a variation in input quantity reflecting the number of attending students. For three years, the number of students was high, followed by a fourth year with surprisingly low student numbers. One of the reasons for this effect was identified to be a new master's program at a competing university, which led to a decrease in students at the host institution.

In the fourth year, the lecturers discussed whether they should discontinue the weekly course evaluation as only eight students attended the course. However, the evaluations were determined to add value and help increase the course quality.

<i>Aspect</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Content of the Current Course (“What”)	34%	29%	22%	9%
Lecturers/Forms of Teaching (“How”)	47%	41%	56%	82%
Course Series’ Concept and Structure	16%	17%	7%	9%
Environmental Conditions/Material	0%	8%	15%	0%
Continuous Evaluation Approach	3%	6%	0%	0%
No. of Comments on Regular Weeks	79	66	27	11
No. of Comments on Company Visits	31	33	37	10
Comment Ratio Regular/Company Visits	2.6	2.0	0.7	1.1
No. of Students in the Course	22	32	31	8
No. of Regular Week Comments per Person	3.6	2.1	0.9	1.4

Table 1. Summary of written comments in the pilot

The comment summary shows that the number of comments per person decreased over the years. A reason for this effect could be that the course improved. Another observation was that students tended to “hide” in the group. The more students in the class, the more likely it was that many of them did not participate in the weekly evaluation or class discussions. The summary also shows trends in the aspects of written comments. Comments regarding the content of single lecturers decreased over the years, while comments about teaching style increased. The other three coded aspects played minor roles.

5 Discussion and Conclusions

The student feedback about continuous evaluation has been mostly positive and the study successfully proves that Kaizen can be applied to university teaching. As part of the action research process, the main lecturer regularly discussed with the students the evaluation results, the purpose of the method, as well as recommendations to further develop the evaluation method. The possibility of influencing course content and style was especially highlighted by the students. After very high activity in the first year, fewer students participated in the weekly evaluation in subsequent rounds. Reasons for this could include the initial amount of course participants (30 instead of 22) and less individual interaction between lecturers and students. Another possibility is to tailor this approach to newly designed courses or changes in the course responsibilities of the faculty. After the initial rounds, proven and reliable courses could result in decreases in evaluation participation and comments.

The participation rate given the high questionnaire frequency was one of the biggest challenges during the pilot study. For the generalizability of evaluation results, approximately 15 completed questionnaires are needed (Rindermann and Schofield, 2001; Rantanen, 2013). As each course had a maximum of 32 students, the number of questions was minimized to lower the required completion time and focus on the most important aspects. For that purpose, the weekly evaluation was inspired by the one-minute questionnaires of Hounsell (2009). The number of 15 or more respondents was most often not reached. The organizers acknowledge the fact that their evaluation did not fulfill the highest formal standards of evaluation research. But through the design of continuous feedback and public discussion of the quantitative and qualitative evaluation, the benefit for lecturers and students is rated to be very high and the representativeness is deemed to be high.

The evaluation survey, inspired by Kaizen, was also subject to continuous improvement. It started with simple questions using the typical German school grading scale and later changed to using selected questions from renowned psychological researchers for standard lectures, courses, and exam evaluation surveys.

Continuous improvement inhibits the chance for innovation (Bessant and Caffyn, 1997). The approach is useful in correcting mistakes in content or slides and in regulating the detail level of certain topics. The concept of continuous course improvement also enables continuous innovation as lecturers can test new ideas, content, and teaching forms and profit from the weekly feedback process (Boer and Gertsen, 2003). Some researchers and teachers also include students in their curriculum design or re-design process (Brooman *et al.*, 2015).

Viewing continuous improvement from the institutional perspective, its success and application is highly dependent on the involvement and conviction of the lecturers. They have to be flexible to continuous changes in their routine, open to replying to evaluation grades and comments every week, and able to encourage students to participate in the feedback circle. The crucial importance

of the involvement and empowerment of process personnel is also confirmed in the literature (Bessant *et al.*, 2001; Hirzel *et al.*, 2017). To evaluate the feedback results at the HEI management level, intra-institutional comparisons and target values are very useful (Abrami, 2001; Kulik, 2001; Smith, 2008). For successful, long-term implementation, the handling of evaluation results should be supported centrally. Combining student evaluation with counseling and didactical support proves to be successful (Cohen, 1980; Dresel and Rindermann, 2011; Penny and Coe, 2004).

Douglas and Douglas (2006b) state that some quality evaluation methods are only successful for average or high performance teachers. When confronting colleagues with new ideas for quality assessment in their university, some interviewees expressed shock or regarded the ideas as attacks on academic freedom. Of the researchers' three proposed methods – peer observation, feedback questionnaires, and mystery student reports – none could convince all faculty members. The same likely also applies to the continuous course improvement approach. Only a few lecturers were involved in the presented action research study and their participation was completely voluntarily. An institution-wide implementation of continuous evaluation could result in higher teaching quality. But it could also lead to problems relating to its acceptance by lecturers as it intervenes in their academic freedom (Emery *et al.*, 2003; Wilkesmann, 2012). Existing quality management systems could profit from using operational teaching measures instead of long-term data. After all, the choice of methods and tools for quality management in higher education institutions has to meet the individual stakeholders' requirements and organizational culture.

6 Limitations and Outlook

The concept of continuous course improvement has only been applied to one course at one university over four years. To prove the discussed theories, further research will have to apply the concept to courses of different sizes and levels in various fields and HEIs. The concept also only focuses on the course quality. It cannot determine how a department or university should manage teaching quality or how holistic quality management systems of those organizations should be designed. Future research could begin at this point and connect continuous course improvement to HEI quality management systems.

Furthermore, the Kaizen approach only addresses the students' view. As previously noted, a university is connected to many stakeholders with different demands and criteria for quality. Student satisfaction could also be argued to be less important than concrete learning or competency results. To measure learning, another instrument would have to be used. Further research could experiment with combining continuous course improvement with continuous learning. For example, Finne (2018) recommends the use of a weekly online quiz to encourage continuous learning and provide a "balanced cognitive load" for students. This idea could be combined with the initial questionnaire presented in figure 2. It could be extended to better assess the prior knowledge of the students and could be designed like an introductory exam without grades. With

the help of this information, a direct comparison between the beginning and end of term would be possible.

When assessing the quality of teaching, exams are often left out. As the literature showed, few universities allowed students to evaluate the quality of exams. In the pilot study course, a classic exam was written at the end of the term. To be allowed to write this exam, students had to pass a practical statistics software midterm exam that did not influence their final grade. A future study could focus on the aspect of examination. One possible direction could be the analysis of different examination forms which could be better suited to encouraging students to actively engage in each course and to supporting their learning (Lengnick-Hall and Sanders, 1997). Kolb and Kolb (2005) emphasize that for advanced students, such as the pilot study course participants, the practical application of theory is even more important.

This article aims to encourage lecturers to interact intensively with students, to foster reflection, to improve the quality of courses, and to continuously experiment with changes in their teaching. The emphasis on critical thinking and continuous reflection follows Deming's maxim: "*A school of business has [the] obligation to prepare students to lead the transformation to halt our decline and turn it upward. They ought to teach the theory of a system and the theory of profound knowledge for transformation*" (Deming, 2000, p. 143).

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8 References

- AACSB International (2018), *2013 Eligibility Procedures and Accreditation Standards for Business Accreditation: Last Revised in July 2018*, Tampa, FL.
- Abrami, P.C. (2001), "Improving Judgments About Teaching Effectiveness Using Teacher Rating Forms", *New Directions for Institutional Research*, Vol. 2001 No. 109, pp. 59–87.
- Ahlstrom, P. (2004), "Lean service operations. Translating lean production principles to service operations", *International Journal of Services Technology and Management*, Vol. 5 No. 5/6, pp. 545–564.
- Aleamoni, L.M. (1999), "Student Rating Myths Versus Research Facts from 1924 to 1998", *Journal of Personnel Evaluation in Education*, Vol. 13 No. 2, pp. 153–166.
- Anderson, J.C. and Rungtusanatham, M. (1994), "A theory of quality management underlying the Deming management method", *Academy of Management Review*, Vol. 19 No. 3, pp. 472–509.
- Andreassen, T.W. (1994), "Satisfaction, Loyalty and Reputation as Indicators of Customer Orientation in the Public Sector", *International Journal of Public Sector Management*, Vol. 7 No. 2, pp. 16–34.

- Antony, J. (2014), "Readiness factors for the Lean Six Sigma journey in the higher education sector", *International Journal of Productivity and Performance Management*, Vol. 63 No. 2, pp. 257–264.
- Antony, J. (2015), "Challenges in the deployment of LSS in the higher education sector", *International Journal of Productivity and Performance Management*, Vol. 64 No. 6, pp. 893–899.
- Antony, J., Krishan, N., Cullen, D. and Kumar, M. (2012), "Lean Six Sigma for higher education institutions (HEIs). Challenges, barriers, success factors, tools/techniques", *International Journal of Productivity and Performance Management*, Vol. 61 No. 8, pp. 940–948.
- Arnheiter, E.D. and Maleyeff, J. (2005), "The integration of lean management and Six Sigma", *The TQM Magazine*, Vol. 17 No. 1, pp. 5–18.
- Ballantyne, R., Borthwick, J. and Packer, J. (2000), "Beyond Student Evaluation of Teaching. Identifying and addressing academic staff development needs", *Assessment & Evaluation in Higher Education*, Vol. 25 No. 3, pp. 221–236.
- Balzer, W.K., Francis, D.E., Krehbiel, T.C. and Shea, N. (2016), "A review and perspective on Lean in higher education", *Quality Assurance in Education*, Vol. 24 No. 4, pp. 442–462.
- Becket, N. and Brookes, M. (2006), "Evaluating quality management in university departments", *Quality Assurance in Education*, Vol. 14 No. 2, pp. 123–142.
- Beran, T., Violato, C., Kline, D. and Frideres, J. (2005), "The Utility of Student Ratings of Instruction for Students, Faculty, and Administrators. A 'Consequential Validity' Study", *Canadian Journal of Higher Education*, Vol. 35 No. 2, pp. 49–70.
- Bessant, J. and Caffyn, S. (1997), "High-involvement innovation through continuous improvement", *International Journal of Technology Management*, Vol. 14 No. 1, pp. 7–28.
- Bessant, J., Caffyn, S. and Gallagher, M. (2001), "An evolutionary model of continuous improvement behaviour", *Technovation*, Vol. 21 No. 2, pp. 67–77.
- Blair, E. and Valdez Noel, K. (2014), "Improving higher education practice through student evaluation systems: is the student voice being heard?", *Assessment & Evaluation in Higher Education*, Vol. 39 No. 7, pp. 879–894.
- Boer, H. and Gertsen, F. (2003), "From continuous improvement to continuous innovation: a (retro)(per)spective", *International Journal of Technology Management*, Vol. 26 No. 8, pp. 805–827.
- Bowen, D.E. and Youngdahl, W.E. (1998), "'Lean' service. In defense of a production-line approach", *International Journal of Service Industry Management*, Vol. 9 No. 3, pp. 207–225.
- Brooman, S., Darwent, S. and Pimor, A. (2015), "The student voice in higher education curriculum design: is there value in listening?", *Innovations in Education and Teaching International*, Vol. 52 No. 6, pp. 663–674.
- Brunet, A.P. and New, S. (2003), "Kaizen in Japan. An empirical study", *International Journal of Operations & Production Management*, Vol. 23 No. 12, pp. 1426–1446.
- Bryant, M. (2013), "International Accreditations as Drivers of Business School Quality Improvement", *Journal of Teaching in International Business*, Vol. 24 No. 3-4, pp. 155–167.
- Cheng, Y.C. and Tam, W.M. (1997), "Multi-models of quality in education", *Quality Assurance in Education*, Vol. 5 No. 1, pp. 22–31.
- Cohen, P.A. (1980), "Effectiveness of student-rating feedback for improving college instruction. A meta-analysis of findings", *Research in Higher Education*, Vol. 13 No. 4, pp. 321–341.
- Cook-Sather, A. (2009), "From traditional accountability to shared responsibility: the benefits and challenges of student consultants gathering midcourse feedback in college classrooms", *Assessment & Evaluation in Higher Education*, Vol. 34 No. 2, pp. 231–241.

- Coughlan, P. and Coghlan, D. (2002), "Action research for operations management", *International Journal of Operations & Production Management*, Vol. 22 No. 2, pp. 220–240.
- Cudney, E.A., Venuthurumilli, S.S.J., Materla, T. and Antony, J. (2019), "Systematic review of Lean and Six Sigma approaches in higher education", *Total Quality Management & Business Excellence*, Ahead of Print.
- Damian, R., Grifoll, J. and Rigbers, A. (2016), "On the role of impact evaluation of quality assurance from the strategic perspective of quality assurance agencies in the European higher education area", *Quality in Higher Education*, Vol. 21 No. 3, pp. 251–269.
- Danese, P., Manfè, V. and Romano, P. (2018), "A Systematic Literature Review on Recent Lean Research: State-of-the-art and Future Directions", *International Journal of Management Reviews*, Vol. 20 No. 2, pp. 579–605.
- Deming, W.E. (2000), *The new economics: For industry, government, education*, 2nd ed., MIT Press, Cambridge, Mass.
- Diamond, M.R. (2004), "The usefulness of structured mid-term feedback as a catalyst for change in higher education classes", *Active Learning in Higher Education*, Vol. 5 No. 3, pp. 217–231.
- Dill, D.D. and Soo, M. (2005), "Academic quality, league tables, and public policy. A cross-national analysis of university ranking systems", *Higher Education*, Vol. 49 No. 4, pp. 495–533.
- Doolen, T.L., van Aken, E.M., Farris, J.A., Worley, J.M. and Huwe, J. (2008), "Kaizen events and organizational performance. A field study", *International Journal of Productivity and Performance Management*, Vol. 57 No. 8, pp. 637–658.
- Douglas, A. and Douglas, J. (2006a), "Campus spies? Using mystery students to evaluate university performance", *Educational Research*, Vol. 48 No. 1, pp. 111–119.
- Douglas, J., Antony, J. and Douglas, A. (2015), "Waste identification and elimination in HEIs. The role of Lean thinking", *International Journal of Quality & Reliability Management*, Vol. 32 No. 9, pp. 970–981.
- Douglas, J. and Douglas, A. (2006b), "Evaluating Teaching Quality", *Quality in Higher Education*, Vol. 12 No. 1, pp. 3–13.
- Dowell, D.A. and Neal, J.A. (1982), "A Selective Review of the Validity of Student Ratings of Teachings", *The Journal of Higher Education*, Vol. 53 No. 1, pp. 51–62.
- Dresel, M. and Rindermann, H. (2011), "Counseling University Instructors Based on Student Evaluations of Their Teaching Effectiveness. A Multilevel Test of its Effectiveness Under Consideration of Bias and Unfairness Variables", *Research in Higher Education*, Vol. 52 No. 7, pp. 717–737.
- Elias, A.A. (2016), "Stakeholder analysis for Lean Six Sigma project management", *International Journal of Lean Six Sigma*, Vol. 7 No. 4, pp. 394–405.
- Elliott, K.M. and Healy, M.A. (2001), "Key Factors Influencing Student Satisfaction Related to Recruitment and Retention", *Journal of Marketing for Higher Education*, Vol. 10 No. 4, pp. 1–11.
- Emery, C.R., Kramer, T.R. and Tian, R.G. (2003), "Return to academic standards. A critique of student evaluations of teaching effectiveness", *Quality Assurance in Education*, Vol. 11 No. 1, pp. 37–46.
- Emiliani, M.L. (2004), "Improving business school courses by applying lean principles and practices", *Quality Assurance in Education*, Vol. 12 No. 4, pp. 175–187.
- Emiliani, M.L. (2005), "Using kaizen to improve graduate business school degree programs", *Quality Assurance in Education*, Vol. 13 No. 1, pp. 37–52.
- Finne, M. (2018), "Improving university teaching. A professional service operation perspective", *International Journal of Operations & Production Management*, Vol. 38 No. 9, pp. 1765–1795.

- Forza, C. (2002), "Survey research in operations management. A process-based perspective", *International Journal of Operations & Production Management*, Vol. 22 No. 2, pp. 152–194.
- Harvey, J. (1998), "Service quality: a tutorial", *Journal of Operations Management*, Vol. 16 No. 5, pp. 583–597.
- Harvey, L. and Green, D. (1993), "Defining Quality", *Assessment & Evaluation in Higher Education*, Vol. 18 No. 1, pp. 9–34.
- Hedin, S.R., Barnes, C.H. and Chen, J.C.H. (2005), "AACSB 2003 accreditation standards. Impact on continuous quality improvement", *International Journal of Services and Standards*, Vol. 1 No. 3, pp. 358–378.
- Hess, J.D. and Benjamin, B.A. (2015), "Applying Lean Six Sigma within the university. Opportunities for process improvement and cultural change", *International Journal of Lean Six Sigma*, Vol. 6 No. 3, pp. 249–262.
- Hirzel, A.-K., Leyer, M., Moormann, J., Brown, S. and Hill, A. (2017), "The role of employee empowerment in the implementation of continuous improvement. Evidence from a case study of a financial services provider", *International Journal of Operations & Production Management*, Vol. 37 No. 10, pp. 1563–1579.
- Hounsell, D. (2009), "Evaluating courses and teaching", in Fry, H., Ketteridge, S. and Marshall, S. (Eds.), *A handbook for teaching & learning in higher education*, 3rd ed., Routledge, Milton Park, GB, Sterling, New York, USA, pp. 198–211.
- Hwang, H.B. and Teo, C. (2001), "Translating customers' voices into operations requirements. A QFD application in higher education", *International Journal of Quality & Reliability Management*, Vol. 18 No. 2, pp. 195–226.
- Imai, M. (1986), *Kaizen, the key to Japan's competitive success*, Random House Business Division, New York.
- Imai, M. (1992), "Comment: Solving Quality Problems Using Common Sense", *International Journal of Quality & Reliability Management*, Vol. 9 No. 5.
- International Standards Office (2011), *Quantitative methods in process improvement -- Six Sigma -- Part 1: DMAIC methodology*, Vol. 03.120.30 No. 13053-1:2011, available at: <https://www.iso.org/standard/52901.html> (accessed 1 April 2019).
- International Standards Office (2015), *Quality management systems -- Fundamentals and vocabulary* No. 9000:2015 (accessed 1 April 2019).
- Kember, D., Leung, D.Y.P. and Kwan, K.P. (2002), "Does the Use of Student Feedback Questionnaires Improve the Overall Quality of Teaching?", *Assessment & Evaluation in Higher Education*, Vol. 27 No. 5, pp. 411–425.
- Koch, J.V. (2003), "TQM: why is its impact in higher education so small?", *The TQM Magazine*, Vol. 15 No. 5, pp. 325–333.
- Kolb, A.Y. and Kolb, D.A. (2005), "Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education", *Academy of Management Learning & Education*, Vol. 4 No. 2, pp. 193–212.
- Kolb, D.A. (2015), *Experiential learning: Experience as the source of learning and development*, 2nd ed., Pearson Education, Upper Saddle River, USA.
- Kollberg, B., Dahlgard, J.J. and Brehmer, P.-O. (2006), "Measuring lean initiatives in health care services. Issues and findings", *International Journal of Productivity and Performance Management*, Vol. 56 No. 1, pp. 7–24.
- Kregel, I. and Coners, A. (2018), "Introducing lean six sigma to a German municipality: an action research report", *International Journal of Lean Six Sigma*, Vol. 9 No. 2, pp. 221–237.

- Kulik, J.A. (2001), "Student Ratings. Validity, Utility, and Controversy", *New Directions for Institutional Research*, Vol. 2001 No. 109, pp. 9–25.
- Lang, J.W.B. and Kersting, M. (2007), "Regular Feedback from Student Ratings of Instruction. Do College Teachers Improve their Ratings in the Long Run?", *Instructional Science*, Vol. 35 No. 3, pp. 187–205.
- Langstrand, J., Cronemyr, P. and Poksinska, B. (2014), "Practise what you preach. Quality of education in education on quality", *Total Quality Management & Business Excellence*, Vol. 26 No. 11-12, pp. 1202–1212.
- Lengnick-Hall, C.A. and Sanders, M.M. (1997), "Designing Effective Learning Systems for Management Education: Student Roles, Requisite Variety, and Practicing What We Teach", *Academy of Management Journal*, Vol. 40 No. 6, pp. 1334–1368.
- Lewin, K. (1946), "Action Research and Minority Problems", *Journal of social issues*, Vol. 2 No. 4, pp. 34–46.
- Machuca, J.A.D., González-Zamora, M.d.M. and Aguilar-Escobar, V.G. (2007), "Service Operations Management research", *Journal of Operations Management*, Vol. 25 No. 3, pp. 585–603.
- Malhotra, M.K. and Grover, V. (1998), "An assessment of survey research in POM. From constructs to theory", *Journal of Operations Management*, Vol. 16 No. 4, pp. 407–425.
- Marginson, S. and van der Wende, M. (2007), "To Rank or To Be Ranked: The Impact of Global Rankings in Higher Education", *Journal of Studies in International Education*, Vol. 11 No. 3-4, pp. 306–329.
- Marimon, F., Mas-Machuca, M., Berbegal-Mirabent, J. and Llach, J. (2018), "UnivQual. A holistic scale to assess student perceptions of service quality at universities", *Total Quality Management & Business Excellence*.
- Marsh, H.W. and Hocevar, D. (1991), "Students' evaluations of teaching effectiveness. The stability of mean ratings of the same teachers over a 13-year period", *Teaching and Teacher Education*, Vol. 7 No. 4, pp. 303–314.
- Miles, M.P., Hazeldine, M.F. and Munilla, L.S. (2004), "The 2003 AACSB Accreditation Standards and Implications for Business Faculty. A Short Note", *Journal of Education for Business*, Vol. 80 No. 1, pp. 29–34.
- Mohd Saad, N., Al-Ashaab, A., Maksimovic, M., Zhu, L., Shehab, E., Ewers, P. and Kassam, A. (2013), "A3 thinking approach to support knowledge-driven design", *The International Journal of Advanced Manufacturing Technology*, Vol. 68 No. 5-8, pp. 1371–1386.
- Moore, A., Masterson, J.T., Christophel, D.M. and Shea, K.A. (1996), "College teacher immediacy and student ratings of instruction", *Communication Education*, Vol. 45 No. 1, pp. 29–39.
- Owlia, M.S. and Aspinwall, E.M. (1997), "TQM in higher education - a review", *International Journal of Quality & Reliability Management*, Vol. 14 No. 5, pp. 527–543.
- Paor, C. de (2016), "The contribution of professional accreditation to quality assurance in higher education", *Quality in Higher Education*, Vol. 22 No. 3, pp. 228–241.
- Patil, A. and Codner, G. (2007), "Accreditation of engineering education. Review, observations and proposal for global accreditation", *European Journal of Engineering Education*, Vol. 32 No. 6, pp. 639–651.
- Peiffer, H., Rach, H., Rosanowitsch, S., Wörl, J. and Schneider, M. (2015), "Lehrevaluation", in Schneider, M. and Mustafic, M. (Eds.), *Gute Hochschullehre: Eine evidenzbasierte Orientierungshilfe*, Springer, Berlin, pp. 153–184.
- Penny, A.R. and Coe, R. (2004), "Effectiveness of Consultation on Student Ratings Feedback. A Meta-Analysis", *Review of Educational Research*, Vol. 74 No. 2, pp. 215–253.

- Pepper, M.P.J. and Spedding, T.A. (2010), "The evolution of lean Six Sigma", *International Journal of Quality & Reliability Management*, Vol. 27 No. 2, pp. 138–155.
- Piercy, N., Brandon-Jones, A., Brandon-Jones, E. and Campbell, C. (2012), "Examining the effectiveness of experiential teaching methods in small and large OM modules", *International Journal of Operations & Production Management*, Vol. 32 No. 12, pp. 1473–1492.
- Ramsden, P. (1991), "A performance indicator of teaching quality in higher education. The Course Experience Questionnaire", *Studies in Higher Education*, Vol. 16 No. 2, pp. 129–150.
- Ramsden, P. (1998), "Managing the Effective University", *Higher Education Research & Development*, Vol. 17 No. 3, pp. 347–370.
- Rantanen, P. (2013), "The number of feedbacks needed for reliable evaluation. A multilevel analysis of the reliability, stability and generalisability of students' evaluation of teaching", *Assessment & Evaluation in Higher Education*, Vol. 38 No. 2, pp. 224–239.
- Rindermann, H. (2009), *Lehrevaluation: Einführung und Überblick zu Forschung und Praxis der Lehrveranstaltungsevaluation an Hochschulen mit einem Beitrag zur Evaluation computerbasierter Unterrichts, Psychologie*, Vol. 42, 2nd ed., Empirische Pädagogik, Landau.
- Rindermann, H. and Schofield, N. (2001), "Generalizability of Multidimensional Student Ratings of University Instruction Across Courses and Teachers", *Research in Higher Education*, Vol. 42 No. 4, pp. 377–399.
- Smith, C. (2008), "Building effectiveness in teaching through targeted evaluation and response. Connecting evaluation to teaching improvement in higher education", *Assessment & Evaluation in Higher Education*, Vol. 33 No. 5, pp. 517–533.
- Spooren, P., Brockx, B. and Mortelmans, D. (2013), "On the Validity of Student Evaluation of Teaching. The State of the Art", *Review of Educational Research*, Vol. 83 No. 4, pp. 598–642.
- Sreedharan, V.R. and Raju, R. (2016), "A systematic literature review of Lean Six Sigma in different industries", *International Journal of Lean Six Sigma*, Vol. 7 No. 4, pp. 430–466.
- Sunder M, V. and Antony, J. (2018), "A Conceptual Lean Six Sigma framework for Quality Excellence in Higher Education Institutions", *International Journal of Quality & Reliability Management*, Vol. 35 No. 4, pp. 857–874.
- Sunder M., V., Ganesh, L.S. and Marathe, R.R. (2018), "A morphological analysis of research literature on Lean Six Sigma for services", *International Journal of Operations & Production Management*, Vol. 38 No. 1, pp. 149–182.
- Susman, G.I. and Evered, R.D. (1978), "An Assessment of the Scientific Merits of Action Research", *Administrative Science Quarterly*, Vol. 23 No. 4, pp. 582–603.
- Swink, M. and Jacobs, B.W. (2012), "Six Sigma adoption. Operating performance impacts and contextual drivers of success", *Journal of Operations Management*, Vol. 30 No. 6, pp. 437–453.
- Tam, M. (2001), "Measuring Quality and Performance in Higher Education", *Quality in Higher Education*, Vol. 7 No. 1, pp. 47–54.
- Times Higher Education (2018), "World University Rankings 2019 methodology" (accessed 1 March 2019).
- Tortorella, G. and Cauchick-Miguel, P.A. (2018), "Teaching lean manufacturing at a postgraduate level. Integrating traditional teaching methods and problem-based learning approach", *International Journal of Lean Six Sigma*, Vol. 9 No. 3, pp. 301–323.
- Wachtel, H.K. (1998), "Student Evaluation of College Teaching Effectiveness. A brief review", *Assessment & Evaluation in Higher Education*, Vol. 23 No. 2, pp. 191–212.

Westbrook, R. (1995), "Action research: a new paradigm for research in production and operations management", *International Journal of Operations & Production Management*, Vol. 15 No. 12, pp. 6–20.

Wilkesmann, U. (2012), "Hat die Governance der Hochschule Einfluss auf den Teaching Approach von Professor/innen? Ergebnisse zweier deutschlandweiter Befragungen von Professor/innen", in Bmbf (Ed.), *Bildungsforschung 2020 - Herausforderungen und Perspektiven: Dokumentation der Tagung des Bundesministeriums für Bildung und Forschung*, BMBF, pp. 179–190.

Womack, J.P. and Jones, D.T. (2003), *Lean thinking: Banish waste and create wealth in your corporation*, Free Press, New York.

Womack, J.P., Jones, D.T. and Roos, D. (1991), *The machine that changed the world: How Japan's secret weapon in the global auto wars will revolutionize western industry*, Harper Perennial, New York.