Postprint of: Owoc M.L., Weichbroth P. (2020) A Note on Knowledge Management Education: Towards Implementing Active Learning Methods. In: Mercier-Laurent E. (eds) Artificial Intelligence for Knowledge Management. AI4KM 2018. IFIP Advances in Information and Communication Technology, vol 588. Springer, Cham. https://doi.org/10.1007/978-3-030-52903-1_10

A Note on Knowledge Management Education: Towards Implementing Active Learning Methods

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Abstract. Knowledge Management as an area of education is still a big challenge for teachers and practitioners. Nevertheless, there are several useful teaching methods in active education, especially oriented towards courses where innovation and delivering dynamic knowledge are critical. The goal of the paper is to present and discuss criteria relevant in the selection of active educational methods supporting knowledge management courses. Examples of real cases from business schools seem to confirm the usefulness of a learner-centered approach.

Keywords: Knowledge, management, education, active learning, lectures.

1 Introduction

Knowledge Management has become a crucial discipline in terms of the rational usage of different resources classified as knowledge granules [1]–[10]. Along this line of thinking, Babcock argues that "poor" knowledge-sharing practices cost the Fortune 500 companies $31.5 billion annually [11], while Greene acknowledges that 74% of organizations estimate that effective knowledge management practices increase company productivity by 10–40% [12]. From a business perspective, knowledge management (KM) is any system that facilitates the sharing, accessing, and updating of business knowledge for people in an organization. A report from 2015, elaborated by the Technology Service Industry Association (TSIA), shows that "KM is of growing interest to professional services, but so far formal processes are not well adopted" [13].

On the other hand, Coakes *et al*. claim that not enough attention has been paid to understanding the failures of knowledge management systems (KMS) [14]. One can observe that the rapid evolution of KMS solutions [15] has triggered the need to provide up-to-date learning resources, communicated in the most effective way. Although in many studies the problem of active teaching methods has been undertaken [16]–[26], only a few go so far as to investigate the extent of knowledge management [27]–[30]. Moreover, this study is motivated by the issues created by Poland's participation in the EU Erasmus+ programme [31], which aims to support education, training, youth and sport in Europe, with a budget of €14.7 billion over seven years (2014–2020).

The objectives of this paper are to (1) examine the criteria possible to apply during the selection of active teaching methods, and (2) evaluate and rethink approaches in knowledge management education, based on three case studies. Note that the case study reported here was not conducted using any formal methodology, but was an attempt to have students actively learn different subjects and topics (e.g. Artificial Intelligence, Data Mining, Data Warehousing, Knowledge Management Systems) included in the Business Informatics curriculum at the Faculty of Management, Computer Science and Finance at Wroclaw University of Economics (WUE), as well as in the program of Data Science studies offered by Gdansk University of Technology (GUT).

The paper proceeds as follows. Section 2 presents the theoretical background of the research, and in Sections 3 and 4, the core of Knowledge Management education is discussed. Active teaching methods are explained in Section 5 with a presentation of the methods implemented during participation in the DIMBI project. The final results of the study, with areas for future research, are itemized in the conclusion.

2 Theoretical background

Studying both Business Informatics and Data Science requires motivated students. The motivation of students for a learning task is commonly defined in terms of the likeliness of achieving set goals [32]. In other words, if students have a considerable chance of success, their motivation will increase, and vice versa [33]. So in order to succeed, students need to obtain understanding, which requires involvement in learning. In view of this, the application of active teaching methods is a must, since engagement is not reflected by passive listeners in a classroom. To make the learning environment in KM-related courses more learner-centered, students need to be actively involved in learning activities.

In terms of critical and creative thinking, a meta-analysis by Cornelius-White, from 2007 [34], shows that learner-centered instruction (LCI) is associated with positive student outcomes: higher assessment scores, greater social connections and increased participation and initiation. Moreover, the analysis reports a reduction in disruptive and resistant behaviour, dropout rates, and school absences. On the other hand, some studies have reported that teacher-centered instruction (TCI) has been preferred because it provides clear expectations and specific learning goals [35]–[37]. Nevertheless, Granger *et al*. [38] compared LCI with TCI, and reported that the former approach facilitates higher learning outcomes, as well as having identified two mediators: student understanding and the self-efficacy of teachers.

The learner-centered paradigm focuses on the learners and their development rather than on the transmission of content [39]. In this regard, Smart *et al*. indicate that current learning theory suggests a different role for teachers – that of facilitators [40], advocating more active, inductive instruction in the classroom. Indeed, Stage *et al*. [41] emphasize the active construction of learners' own knowledge rather than passively receiving information transmitted to them from teachers and textbooks. In other words, knowledge should not be simply given to students, but they must construct their own meanings [42]. In this way, "teachers do less telling; students do more discovering"

[43]. Therefore, the teacher's role is to design and lead the course in a way that facilitates a climate for effective learning by actively helping and encouraging students to learn from and with each other, consequently providing relevant feedback throughout the process [44].

3 Perspectives on Knowledge Management

To discuss the topic of teaching the subject of knowledge management, we begin by providing its definitions, introduced over the last 20 years. Having reviewed the literature, we are (unfortunately) still inclined to agree with Shin *et al*. [45] that "*a universally accepted definition of KM (knowledge management) does not exist yet*", which has also been confirmed by other researchers [46]–[49]. The definitions listed below, which are but a representative sample, are further briefly discussed.

Table 1. Perspectives on Knowledge Management.

Author (Year)	Perspective on Knowledge Management
De Jarnett (1996)	(…) is knowledge creation, which is followed by knowledge interpretation, knowledge dissemination and use, and knowledge retention and refinement [50].
Quintas *et al*. (1997)	(…) is the process of continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities [51].
Hibbard (1997)	(…) is the process of capturing a company's collective expertise wherever it resides - in databases, on paper, or in people's heads - and distributing it to wherever it can help produce the biggest payoff [52].
Bergeron (2003)	(…) is a deliberate, systematic business optimization strategy that selects, distills, stores, organizes, packages, and communicates information essential to the business of a company in a manner that improves employee performance and corporate competitiveness [53].
Jennex (2007)	(…) is the practice of selectively applying knowledge from previous experiences of decision making to current and future decision-making activities with the express purpose of improving the organization's effectiveness [54].
Handfield *et al*. (2015)	(…) organized and systematic process of generating and disseminating information, and selecting, distilling, and deploying explicit and tacit knowledge to create unique value that can be used to achieve a competitive advantage in the marketplace by an organization [55].

As follows from the above, the notion of knowledge management has been defined from different perspectives, and therefore in different ways. Firstly, a detailed reading of the definitions reveals that knowledge management is understood as relating to both theory and practice – for example, the definitions of De Jarnett (1996) and Jennex (2007), respectively. Secondly, Quintas *et al*. and Hibbard (1997), as well as Handfield *et al*. (2015), began by using the word "process" which by dictionary definition means a series of actions that one takes in order to achieve a result [56]. Indeed, according to Alavi and Leider [57], knowledge management is largely regarded as a process involving various activities, and a minimum of four basic tasks must exist, namely creating, storing/retrieving, transferring and applying knowledge. Thirdly, individuals and learning are the priority facets of KM, since the vast majority of the existing literature covers these two related aspects, usually in an organizational context [58]–[65], and more recently focusing on the representation of empirical knowledge and methods and systems of reasoning [66]–[77].

Moreover, the wide range of definitions also reflects the fact that those authors studying the subject represent a broad spectrum of disciplines, such as computer science, engineering, management science, psychology, etc. Having said that, we conclude that knowledge management is a multidisciplinary field drawing from many subject areas. In addition, it is worth noting here that through diffusion with information technologies, knowledge management is still evolving and has become the fastest growing hub for creating innovations and shaping the future of business and science [78].

4 Knowledge Management Education

4.1 Education providers

Chaudhry and Higgins (2003) report that knowledge management courses are mainly offered at the graduate level [79]. Their study covered five countries (Australia, Canada, Singapore, the UK and the USA), and in total embraced 37 KM courses, the substance of which, in general, concerned topics such as business, computing and information, being part of the curricula in the departments and divisions of information systems.

In Poland, there are several universities in which knowledge management is present during the first (bachelor) and second (master of science) degrees of studies, offered by the most prestigious and the highest-ranking academic institutions, including:

- Adam Mickiewicz University in Poznan,
- AGH University of Science and Technology,
- Gdansk University of Technology,
- Jagiellonian University,
- Nicolaus Copernicus University,
- University of Wroclaw,
- Warsaw University of Technology,
- Wroclaw University of Economics and Business.

The course titles are generally the same, but in a few cases also concern intellectual capital or learning organizations.

4.2 Course content

In total, the review encompasses the content of 10 course syllabuses, offered by particular departments. Their later synthesis indicates that the following topics are frequently included.

Table 2. Curriculum areas and topics in knowledge management courses.

Area	Topics
1. Foundations	▪ definitions and concepts related to the theory of data, information, knowledge, wisdom and vision; ▪ knowledge management theory; ▪ forms of knowledge (tacit, explicit); ▪ sources of knowledge: individual, groups, communities, crowdsourcing, and know-hows, instructions and ontologies; ▪ knowledge workers and intellectual capital; ▪ knowledge-based organizations.
2. Technology	▪ the evolution of IT systems (expert systems, knowledge-based systems, business intelligence systems); ▪ intranets, extranets, collaboration and social network tools, corporate portals; ▪ requirements elicitation and analysis; ▪ data, information and knowledge architectures and architects; ▪ examples of IT tools and systems.
3. Process	▪ knowledge management models; ▪ knowledge acquisition and mapping; ▪ organization and categorization of knowledge resources; ▪ developing and maintaining knowledge repositories; ▪ auditing and tracking knowledge repositories.
4. Applications	▪ lessons learned, case studies and success stories of IT tools and systems design, implementations and deployments; ▪ considerations for knowledge management applications in different domains, sectors (public, private) and industries; ▪ student hands-on activity: designing, implementing and deploying KM services in an organization.
5. Strategies	▪ categories of knowledge management strategies; ▪ the process of knowledge management strategy development; ▪ sustainable development of an organization's intellectual capital; ▪ human resources department and its support and responsibilities in employee development;

First of all, we grouped frequently included topics into five categories. It seems that these areas can be considered as the foundations of knowledge management lectures. Secondly, course content in general emphasizes the role of the individual, even though the labels strongly indicate the organizational context. Thirdly, in a few courses, law-oriented topics were included in the end; however, we concur that these are not the core substance of the KM domain. Fourthly, a pro-sharing culture and practices were also listed as essential indicators in building knowledge-based organizations. Finally, the specified classification of KM topics is nonetheless an open list that can be supplemented as desired. In view of this, for the purpose of classification into a consistent arrangement, we have rephrased the topics and rearranged them under the principles of qualitative synthesis research (keeping the substance of the content intact).

4.3 Identified differences

The bulk of course syllabuses varied strongly in general. While some are focused on developing students' soft skills, others are strongly oriented towards a particular IT platform with the aim of learning how to design and implement specific tasks. In particular, the latter aim to demonstrate how to capture and share key information within an organization to enable effective decision-making, as well as how to implement a communication strategy where teams can switch to efficient searching, sorting and sharing of knowledge assets. Whereas the former type puts an emphasis on actively engaging students in reflective exercises, systematically conducted throughout the course. In so doing, such courses therefore have specific learning outcomes that firmly correspond to contemporary knowledge management theory.

5 Active Teaching Approach

5.1 The Learning Pyramid

A crucial category in the education process is the approach to learning. The approach can be identified with ideas or a set of principles about the nature of learning. Current analyses of the effectiveness of particular approaches in education prove that traditional forms of delivering knowledge through lecturing are not successful. This problem is frequently presented in the Learning Pyramid, embracing the basic orientation in teaching nowadays (see Fig. 1 below).

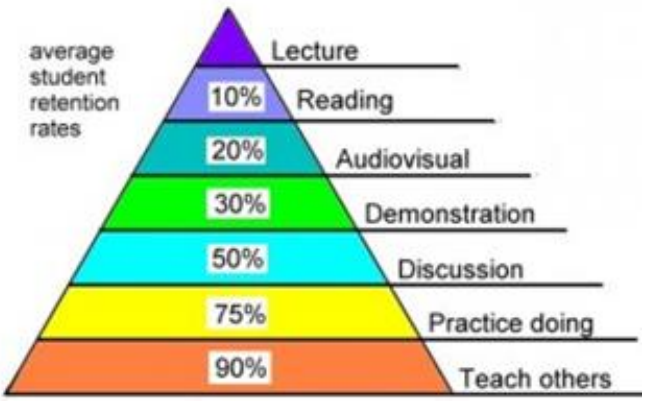

Fig. 1. The Learning Pyramid [80].

The picture reflecting the average student retention rates (as a simplified measure of delivered knowledge) proves the superiority of more active approaches (in this Figure, referenced by the three layers placed at the lowest parts of the pyramid: discussion, practice doing and teach others) irrespective of educational areas. There is a vast amount of teaching methods or techniques which represent approaches covering several layers of the learning pyramid [81]–[83]. Some of them are oriented towards teachers while others towards learners. Learner-oriented education can be identified mostly with active teaching methods.

5.2 Active Teaching Methods

There is a need for a diversification into two essential categories in the demonstration of particular approaches: teaching methods and teaching techniques. A method can be defined as a description of the way that knowledge is delivered to learners during the instructional process or during the training activities of learners (for example: making projects). One may also add that a method is a systematic way of doing something according to an earlier established approach. A teaching technique can be identified with a guideline for any teaching activity (for example: mind mapping). Therefore, teaching techniques are more oriented towards the implementation of specific ways of delivering knowledge to or shaping the capabilities of learners. To sum up, a learning approach determines the teaching methods and, in turn, particular methods require the adequate teaching technique(s). We focus in the paper on teaching methods which are typical for active approaches in education, assuming the implementation of relevant teaching techniques in such a context.

There are several taxonomies of teaching methods which stress the critical features of a particular typology of methods [84]–[86]. We have reduced the list of available teaching methods to the following items:

- **Collaborative Virtual Classrooms** – interpreted as an online learning environment that allows live interaction between the tutor and the learners as they are participating in learning activities. Collaboration among participants in the established learning environment are crucial in this method [87]–[89].
- **Brainstorming** – identified with the creativeness of participants in solving problems by gathering a list of solutions in a spontaneous way. Independent and unlimited proposals of ideas for finding conclusions by members of a team, respectful of one another, are specific in this method [90]–[92].
- **Making Projects** – oriented towards the practical implementation of theoretical domain knowledge and trained abilities to create a new solution in the defined environment. The project method, performed through several steps, allows students to deal with potential circumstances playing more and more the role of managers; individual or team endeavours in obtaining the defined goals are typical in this method [93]–[95].
- **Role Playing** – an approach of learning focused on exploring using students' realistic situations by interacting with other people in order to develop experiences and trial different strategies in a supported environment. This method allows for progress in understanding and improving different positions of team members [96]–[98].
- **The 'Flipped Classroom'** – an instructional blended learning strategy related to delivering instructional content outside of the classroom through forcing students to elaborate teaching materials themselves. It denotes a more individual method of teaching, oriented towards the investigation of knowledge acquisition [99]–[101].
- **Case Studies** – an instructional method referring to assigned scenarios based on situations in which students observe, analyse, register, implement and summarize, or recommend. The main advantage of this method is dealing with real problems and ways of creating solutions [102]–[104].
- **Discussions** – a group activity involving a teacher as well as students to define a problem and search for its solutions; therefore, this constructive process involves listening, thinking and, as a result, exchanging ideas. Again, the activeness of team members and improving ways of argumentation are specific in this method [105]–[107].
- **Game-based Learning** – a teaching method consisting of the exploration of different components of games. Playing a game motivates participants and shapes capabilities in obtaining the defined aims. Social aspects and respecting rules are important in this method [108]–[110].

In all the presented teaching methods students are encouraged to be active and, in most cases, they should work as co-operators or competitors. Regardless of the implemented teaching methods, improvements in the capabilities of students in the knowledge management domain are related with the following objectives:

- **capture knowledge**: this goal can be achieved by creating knowledge management repositories. Those will consist of structured documents with knowledge embedded in them, such as memos, reports, presentations and articles, which are stored in a way that they may be easily retrieved;

- **improve knowledge**: access with the aim of facilitating the processes of knowledge transfer between individuals and between organizations;
- **enhance the knowledge environment**: by proactively facilitating and rewarding knowledge creation, transfer and use;
- **facilitate knowledge management**: as an asset, some companies are including their intellectual capital in the balance sheet, others are leveraging their knowledge assets to generate new income from or to reduce costs with their patent base.

Arguably, the purpose of education is to open the minds of students and equip them with the wherewithal – essentially knowledge – with which to envisage and create the preferred future (and not merely respond to circumstances or events). In the age of globalization, accelerating technological change and increased competition, knowledge management can help educational institutions - be they public, private or the object of public-private partnerships - improve teaching for better learning outcomes. In education, as elsewhere, knowledge management can bring together people, processes and technologies to enable the discussed institutions to accomplish their missions. The objectives of KM studies still remain as follows (in terms of educational approaches):

- diversification of learning levels;
- different aims of teaching;
- variety of the components of education.

The list of teaching methods previously presented can be implemented in knowledge management teaching. Undoubtedly, particular teaching methods fulfil the assumed objectives of knowledge management education. However, one more thing must be discussed in the context of successful teaching, namely organizational learning, in which individual as well as team aspects should be included. The general idea of this perspective is presented below.

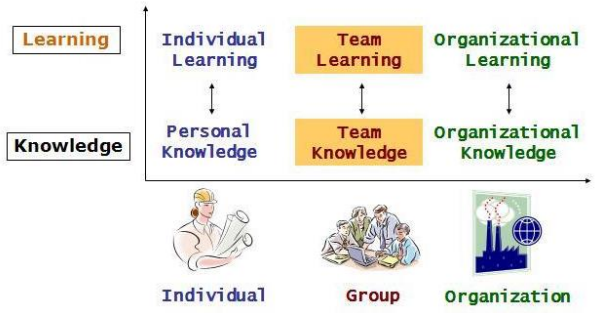

Fig. 2. Organizational Learning and Knowledge Management Perspective [111].

Any of the discussed active teaching methods can be useful in supporting the acquisition of individual and team (and finally organizational) knowledge and the training capabilities of the participants. However, the question arises of how to select the most adequate method for particular educational institutions.

5.3 Selection Criteria for Active Teaching Methods

The general idea of the selection of teaching methods is presented in the Figure below. The rationale behind the choice of the relevant method should incorporate the participants of the educational processes, the subjects to be taught and the learning infrastructure. The interrelationships between the discovered factors of the selection can be a base for the proposed steps in the general choice concept scenario.

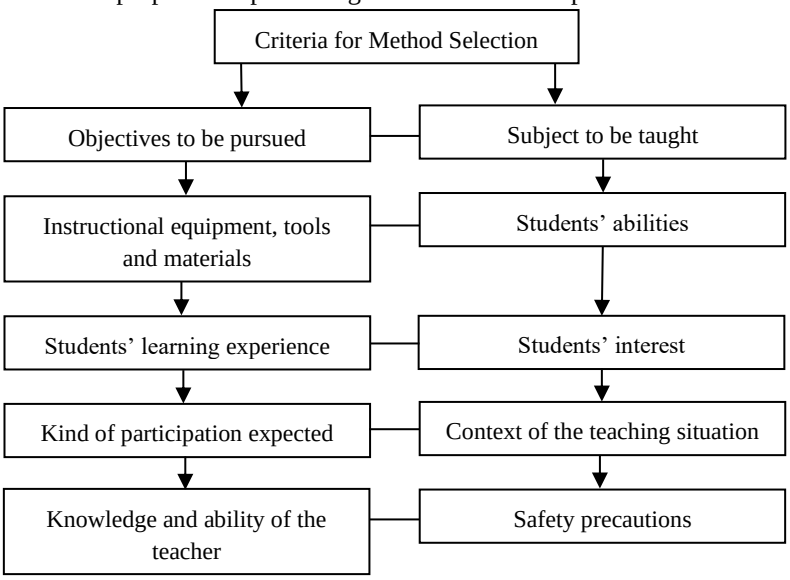

Fig. 3. Framework for the selection of teaching methods. Source: adopted from [112].

The criteria embrace teacher properties (knowledge and ability), student characteristics (abilities, experience and interests) and other determinants: equipment, tools, and the teaching context.

The described approach for the selection of teaching methods has been applied in the DIMBI (Developing the Innovative Methodology of Teaching Business Informatics) framework project. The main goals of the project embrace:

- **analysis** of existing teaching methods applied in Business Informatics education,
- **preparation** of teaching methods useful in BI courses,
- **elaboration** of e-learning platforms supporting BI teaching,
- **sharing** of Active Books useful in performing selected BI courses.

The results of this project are available for students studying Business Informatics at the Bachelor level. Initially, the results were implemented in three partner universities: Wroclaw University of Economics (WUE), Varna University of Economics (VUE) and Jan Wyzykowski University (JWU) in Polkowice. The initial results of the implemented active teaching methods are presented in Table 1. The research was limited to education in Knowledge Management using a questionnaire addressed to teaching staff.

In particular, the following objectives were investigated in the research:

- understanding the objectives of Knowledge Management in the Business Informatics field of study,
- understanding the process of knowledge acquisition from data in the context of KM,
- gathering the skills necessary to collect project stakeholders' requirements in terms of the KM domain as an element of BI education,
- discovering the most important features and capabilities of BI tools supporting Knowledge Management.

Table. 3. Implemented teaching methods in KM education

Active teaching method	WUE	VUE	JWU
Collaborative Virtual Classroom	1	1	2
Brainstorming	2	3	2
Making Projects	3	2	3
Role Playing	1	1	2
The Flipped Classroom	1	0	1
Case Studies	3	2	3
Discussions	2	2	3
Game-based Learning	1	0	1

0 – not implemented, 1 – initial stage, 2 – partly implemented, 3 – fully implemented.

The initial results of the research confirm the usability of the selected active teaching methods in KM education. The methods most often used were Making Projects and Case Studies. In the case of KM education, students entered companies and solved problems (mostly working in teams) defined by company managers. On the other hand, academic staff very rarely used Flipped Classroom and Game-based Learning. The reason was the lack of tradition in implementing these methods (Flipped Classroom) as well as the lack of attractive tools (Game-based Learning).

6 Conclusions and future research

In an atmosphere of increased external and internal pressures for improvements in education, the need for effective teaching methods has never been greater – yet there is a real risk of competency gaps. However, the real need for improvements in Knowledge Management education seems to be obvious. Active teaching methods should be implemented in Knowledge Management courses on a wider scale. The implementation of active teaching methods in Knowledge Management has been proposed in ongoing educational projects.

Despite the challenges to implement learner-centered instruction (LCI) by many individuals and organizations – typical for active teaching methods – LCI has not been included in the "Development strategy of higher education in Poland until 2020" [113], prepared by Ernst & Young and Gdansk Institute for Market Economics. We believe

that the six strategic goals, namely diversity, openness, mobility, competition, effectiveness and transparency, should be reconsidered in terms of the learner-centered paradigm and active teaching methods in the next agenda.

Our future research will cover the following topics: applying a hybrid way of teaching (different scenarios for KM topics), the utilization of ICT tools to monitor the results of the inception of active teaching methods, and eventually developing and assimilating these methods to teaching areas through existing and new courses in Business Informatics studies.

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