

## Analysis of Learning Assignments Applying ERP-Systems in Textbooks for Commercial Colleges in Austria

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### Abstract

*Enterprise-Resource-Planning-Systems (ERP-Systems) – such as SAP, BaaN, Infor LN, MS Dynamics, WinLine and BMD – are becoming increasingly important for private and public enterprises and NGOs around the globe. The use of ERP-Systems leads to changing (vocational) working routines. ERP-Systems are therefore an important subject for vocational education and – from a scientific viewpoint – a research topic of high interest. However, only a very limited number of journal articles are available that address the use of ERP-systems in the context of business education. This article contributes to this field of research with an analysis of learning assignments applying ERP-Systems. First, the theoretical background for the analysis of learning assignments applying standard commercial software (ERP-systems) is outlined. Second, the results of a qualitative content analysis study on 1,921 learning assignments in textbooks for commercial colleges in Austria are presented and discussed. The paper is concluded by recommendations for action and the most important implications for future work and future research and development in this field.*

### Introduction

Enterprise-Resource-Planning-Systems (ERP-Systems) – such as SAP, BaaN, Infor LN, MS Dynamics, WinLine and BMD – are a type of business management software that supports the execution of business processes in areas like procurement, production, planning, sales, finance and controlling, asset management, and human resource management in an integrated manner (Gronau, 2013; Hesseler & Görtz, 2010, p. 7; Hansen & Neumann, 2005, p. 529). ERP-Systems are a very important tool for the vast majority of business administration activities. They are becoming increasingly important for private and public enterprises and NGOs around the globe in order to run their businesses efficiently and to stay competitive (e.g. Wailgum, 2008). Today 80% of German enterprises with a headcount of more than 50 make use of ERP-Systems (ERP-Studie, 2011). 75% of big, 45% of mid-size, and 15% of small enterprises in Austria are currently using ERP-Systems to run their businesses (Statistik Austria, 2011). The use of ERP-Systems leads to changing (vocational) working routines (Pongratz, Tramm & Wilbers, 2010, p. 5; Scholz, 2007, p. 50). As an example, the execution of many business processes has been automated to a big extent. Hence, workers are no longer only business case handlers. They also need to be able to handle upcoming failures as well (Siemon, 2007, p. 14). These changes in working life imply changes in qualification requirements of current and future staff (Tramm, 2010, p. 77 and 99). ERP-Systems are therefore an important subject for vocational education and a research topic of high interest. However, only a very limited number of journal articles are available that address the use of ERP-systems in the context of business education (Moon, 2007, p. 246; Addo-Tenkorang & Helo, 2011, p. 1132). This article contributes to this field of research with an analysis of learning assignments applying ERP-Systems.

Learning assignments in general do have strong influence on planning and execution of classroom lessons (e.g. Engelhardt, 2008; Gerdsmeier, 2004). They are essential to competence-oriented teaching (e.g. bm:ukk, 2012, p. 12; Schmit et al., 2010; Klieme, 2004, p. 628). However, the analysis of learning assignments is one of the most ignored research fields (Blömeke, 2009, p. 17; Gerdsmeier, 2004). Learning assignments applying ERP-Systems have not been analyzed systematically so far. The purpose of this article is to contribute to filling this research gap.

### **Research questions and research outline**

Based on the above considerations the focal point of this article is set to the following research questions:

1. What are the didactical requirements for learning assignments applying ERP-Systems according to the status of research?
2. To which extent do learning assignments in textbooks for commercial colleges meet current didactical requirements?

Research related to question one is addressed through a hermeneutic approach. A review of literature is done both on vocational education applying ERP-Systems and on past analyses of learning assignments. The outcome of this research step is a deductively derived category system (Mayring, 2010, p. 66) for the analysis of learning assignments that addresses didactical requirements for vocational education in the field of ERP-Systems. Research question two is addressed through a qualitative content analysis study. The deductively derived category system is used as a research instrument for assessing to which extent learning assignments meet current didactical requirements.

### **Theoretical investigations**

This chapter outlines the definition of didactical requirements and the composition of a category system through theoretical investigations. A review of literature shows that on the one hand ERP-Systems are becoming more and more important for vocational education but on the other hand that the current use of ERP-Systems in business education is not satisfactory. The problems and difficulties can be summarized as follows:

- Education applying ERP-Systems is mainly arranged as a pure click-training (Wilbers, 2010, p. 67 and 72; Eberle, 2010, p. 107)
- Phases of reflection and/or abstraction are offered only rarely and model oriented learning almost gets ignored (Siemon, 2007, p. 15 and 20; Tramm, 2010, p. 78, 88 and 98)
- Phases of experimental exploration are not offered (Wilbers, 2010, p. 67 and 72)
- A lack of business process orientation and a use of traditional routines instead of business processes can be observed (Wilbers, 2010, p. 72; Tramm, 2010, p. 77–100; Siemon, 2007, p. 16)
- Unconnected learning assignments without relevance to practice are frequently used (Getsch & Preiss, 2003, p. 6–8).

Based on these problems and difficulties in the current use of ERP-Systems in business education, the following didactical requirements can be formulated:

- Learning assignments applying ERP-Systems
- should contribute to overcome problems and difficulties in the current use of ERP-Systems in business education as summarized above
- need to support the general purpose of business education: Development of vocational action competence (e.g. Pätzold, 2006, p. 72).
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An analysis of 16 recent articles on the analysis of learning assignment shows that in particular the contributions of Maier et al. (2010), Bloemen et al. (2010), Bloemen (2011) and Kastrup & Tenfelde (2008) contain proven categories which consider all aspects of the didactical requirements outlined above. Bloemen et al. (2010) use a model of vocational action competence for their analysis of common vocational learning assignments. That model consists of six sub-competences that are mutually conditional on each other and enrich one another.

**Figure 1: Vocational action competence in the ERP-domain**

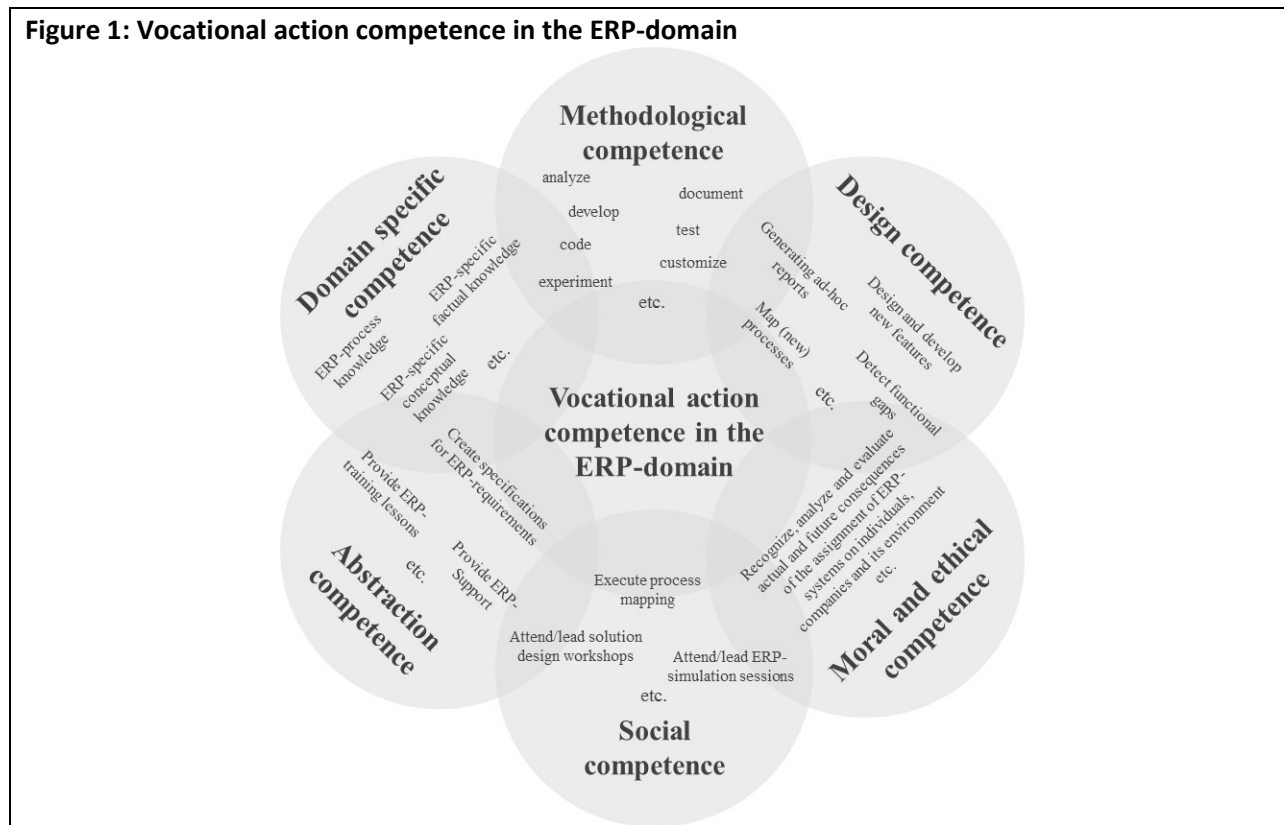


Figure 1 shows the competence model for common vocational action competence used by Bloemen et al. (2010, p. 200). In addition the model has been supplemented with typical ERP-specific competences to substantiate the outlined common sub-competences in the context of ERP-Systems. The different requirement-levels in each category are defined based on a cognitive model of holistic learning by Rebmann & Schlömer (2011). Kastrup & Tenfelde (2008) make use of the same competence model as

well as Bloemen (2011) who, in addition, introduces the categories openness, reference to everyday life, and reference to business processes for analyzing common vocational learning assignments. From Maier et al. (2010), the category representation of knowledge has been adopted for the current analysis of learning assignments.

The selection of these categories can be justified as follows. To enable holistic learning in the sense of the constructivist paradigm, learning assignments have to be open, refer to everyday life (Bloemen, 2011, p. 66), and use a variety of knowledge representation (Maier et al., 2010, p. 39–40). The category reference to business processes has been selected in order to reflect the importance of process orientation in business administration and in vocational education (Rebmann & Schlömer, 2011, p. 6–8). Due to space constraints, the theoretical foundations of the category system cannot be outlined further here – refer to Kombacher (2013) for more details. However, the category system with its sub-categories and different requirement levels is presented in the following chapter together with the corresponding empirical results.

### **Empirical Results**

Out of 78 approved textbooks for the Austrian Handelsakademie (Commercial College) for subjects such as business administration, business training, project and quality management, practice firm and case studies, financial accounting and controlling, business informatics, and political economy 41 textbooks have been analyzed. All of these 41 textbooks are from the two biggest publishers for vocational textbooks in Austria. In this article these publishers are named A and B for reasons of data protection. The analysis shows that 26 textbooks contain learning assignments applying ERP-Systems. In total, 1,921 learning assignments have been analyzed. More than 99% of the learning assignments are related to financial accounting and controlling, the rest (less than 1%) are related to business administration. The research results contained in the tables below are aggregated by publisher. Columns named A and B contain the respective figures. In columns named C, figures from an analysis of common vocational learning assignments (n=1,328) by Bloemen (2011) are presented for comparison purposes. Table 1 shows to which extent learning assignments contribute to fostering sub-competences of vocational action competence. Learning assignments can either not consider the respective sub-competence or foster it up to a certain skill level. Depending on the respective sub-competence, each of the four skill levels have different meanings. These different meanings are outlined in lines named level description. E.g. Level 2 in the context of Domain specific competence means Connect. Figures of Table 1 show that vocational action competence is not fostered in a comprehensive manner, neither within textbook package A nor textbook package B. The focal point in both textbook packages is orientated towards fostering domain specific competence. Methodological competence is considered only partially while abstraction, design, social, moral, and ethical competences are ignored almost completely.

Table 1  
Frequencies of coded sub-competences

Vocational action competence	Frequencies in %														
	Not considered			Level 1			Level 2			Level 3			Level 4		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Level description	Not considered			Remember			Connect			Design			Reflect		
Domain specific competence	1.0	4.8	3.4	16.7	22.9	70.4	82.1	72.3	19.1	0.2	0.0	4.8	0.0	0.0	2.3
Methodological competence	92.5	96.4	63.7	0.0	0.0	20.6	7.5	3.6	2.8	0.0	0.0	11.5	0.0	0.0	1.4
Moral and ethical competence	100.0	100.0	79.6	0.0	0.0	15.1	0.0	0.0	4.2	0.0	0.0	0.7	0.0	0.0	0.4
Level description	No abstraction competence			Structure knowledge			Communicate knowledge			Develop knowledge			Reflect		
Abstraction competence	98.8	97.1	60.2	1.2	2.3	33.5	0.0	0.0	2.7	0.0	0.6	3.3	0.0	0.0	0.3
Level description	No design competence			Minor degrees of freedom			Anticipate			Major degrees of freedom			Reflect		
Design competence	99.8	100.0	84.9	0.2	0.0	7.6	0.0	0.0	1.7	0.0	0.0	4.5	0.0	0.0	1.3
Level description	No social competence			Recognize interpersonal issues			Cooperative development			Cooperative design			Reflect		
Social competence	100.0	99.4	81.3	0.0	0.0	14.2	0.0	0.6	2.6	0.0	0.0	1.8	0.0	0.0	0.1

In the field of domain specific competence, the focal point is on skill level 2 (82.3% in package A and 72.3% in package B). This skill level requires to connect knowledge and skills gained in former experiences with new learning assignments. A typical example for such a learning assignment is that students are requested to enter a transaction into an ERP-System based on an original voucher whereby the individual steps of entering a transaction have been demonstrated before in a very detailed way. Remembering and reciting knowledge is required in 16.7% (package A) and in 22.9% (package B) of the analyzed learning assignments. Neither workbook package A nor B contain learning assignments for skill level 4 (reflect). A comparison between packages A and B with C shows that package C mainly contains learning assignments for level 1 (remember) while the focal point of packages A and B is on level 2 (connect). These results provide confirmation for the frequently criticized quality of learning assignments. One complaint is that learning assignments with common vocational content mainly foster skills on level 1 (remember) (Bloemen, 2011, p. 116 and Schalek, 2007, p. 211). The majority of learning assignments applying ERP-Systems fosters level 2 (connect) in the field of domain specific competence, while other competences are ignored almost completely. This finding supports the frequently raised concern that the use of ERP-Systems in vocational lessons at commercial colleges takes place as a kind of click training only (see above). In the category openness of problem statement (Table 2), the number of learning assignments without a corresponding problem statement is very low – both in textbook packages A and B as compared to C.

Table 2

*Frequency distribution – openness of problem statement*

Openness of problem statement	Frequencies (in %)		
	A	B	C
(0) = no problem statement	17.1	27.4	53.7
(1) = problem statement is complete	55.8	61.5	42.8
(2) = problem statement is incomplete	27.2	11.0	3.2
(3) = problem has to be identified	0.0	0.0	0.3
Total	100.0	100.0	100.0

The numbers reflect that learning assignments applying ERP-Systems (packages A and B) are mainly designed application-oriented bearing a realistic vocational problem, whereas common vocational learning assignments (package C) mainly consist of knowledge questions. Also striking is the fact that the number of learning assignments with incomplete problem statements is remarkably high in textbook packages A and B as compared to C. A typical example for learning assignments on that level is that students are requested to reconstruct business transactions from a disordered collection of vouchers and enter the transactions into an ERP-System. Learning assignments which enforce students to identify problems (level 3) are unavailable in textbook package A and B.

Table 3

*Frequency distribution – openness of procedures*

Openness of procedures	Frequencies (in %)		
	A	B	C
(0) = no procedures required	17.1	27.4	41.4
(1) = procedures completely defined	55.8	61.5	50.9
(2) = procedures partially defined	27.2	11.0	5.1
(3) = viable procedures to be identified	0.0	0.0	2.6
Total	100.0	100.0	100.0

For textbook packages A and B, the results of the category openness of procedures (Table 3) are congruent with those of the category openness of problem statement (Table 2). The reason is that within the respective learning assignments, procedures are closely linked to the respective problem situation – just like in a recipe that describes what a cook should do. Accordingly, only learning assignments with incomplete problem statements allow a variation in procedures as for example applying different methods of entering transactions.

Table 4  
*Frequency distribution – openness of results*

Openness of results	Frequencies (in %)		
	A	B	C
(1) = one clear result	71.6	89.0	73.2
(2) = few results	28.4	11.0	17.8
(3) = no clear result	0.0	0.0	9.0
Total	100.0	100.0	100.0

As results in Table 4 show, the vast majority of the analyzed learning assignments are aimed at one clear result. With 89.0%, this value is extraordinary high for learning assignments of textbook package B.

Table 5  
*Frequency distribution – reference to everyday life*

Reference to everyday life	Frequencies (in %)		
	A	B	C
(0) = no reference to everyday life	0.2	0.4	12.8
(1) = implicit reference to everyday life	20.6	11.8	49.7
(2) = explicit reference to everyday life	79.2	87.8	31.3
(3) = reflection on everyday life experiences	0.0	0.0	6.2
Total	100.0	100.0	100.0

As the numbers in Table 5 show, most of the analyzed learning assignments applying ERP-Systems are characterized by their explicit reference to everyday life. This is significantly better than the common vocational learning assignments of textbook C. Unfortunately, no learning assignments are available which force students to reflect on everyday life experiences – such as working with an ERP-System in a practice firm or virtual enterprise.

Table 6  
*Frequency distribution – reference to business processes*

Reference to business processes	Frequencies (in %)		
	A	B	C
(0) = no reference to business processes	13.5	24.5	25.2
(1) = reference to tiny working processes	65.1	59.2	57.7
(2) = reference to crosslinking business processes	11.7	6.8	11.4
(3) = reference to comprehensive business processes	9.7	9.4	5.7
Total	100.0	100.0	100.0

In the category reference to business processes (Table 6), learning assignments applying ERP-Systems (textbook package A and B) score better than common vocational learning assignments (textbook C). However, it must be taken into account that the main purpose of ERP-Systems is to support various kinds of business processes. Given this viewpoint, the portions of learning assignments with references to comprehensive business process and reference to crosslinking business processes are quite small.

Table 7

*Frequency distribution – representation of information*

Representation of information	Frequencies (in %)		
	A	B	D
(1) = one	50.6	58.5	66.1
(2) = integration	49.4	41.5	25.2
(3) = transformation	0.0	0.0	2.4
absent	-	-	6.3
Total	100.0	100.0	100.0

The number of learning assignments on level 2 in the category representation of information (Table 7) is comparatively high. The reason is that in many of the learning assignments original vouchers are used to present information to students instead of just formulating problems in text form. None of the learning assignments require a transformation of information respective to knowledge. An example of such a learning assignment is that students are requested to design a business process as an event driven process chain taking various features of an ERP-System into account. The benchmarks in column D of Table 7 are taken from an analysis of learning assignments by Maier et al. (2010) which is based on 127 learning assignments for the subjects German, Mathematics, Nature, and Social Sciences.

Summarizing the above, it can be said that learning assignments applying ERP-System do not foster the development of vocational action competence in a comprehensive way. In the categories of openness, reference to everyday life and business processes and representation of information, the scores of learning assignments applying ERP-Systems are significantly better than the scores of common vocational learning assignments. However, in each category a lack of learning assignments for the respective highest level can be observed. Therefore, it can be stated that holistic learning in the sense of the constructivist paradigm is not optimally supported by the analyzed learning assignments applying ERP-Systems.

#### **Future research and recommendations for action**

The study presented in this article delivers only the first insights into the quality of learning assignments applying ERP-Systems. The current study is limited to Austrian textbooks. For proven results, further research is required. The methodology outlined in this article can act as a basis for future analysis of learning assignments on an international scale. Comparative international studies (e.g. Schalek, 2007; Engelhardt, 2008) have shown a comparably poor quality of common vocational learning assignments. Therefore, it appears reasonable to assume that the quality of learning assignments applying ERP-Systems in other countries is comparably poor as it is in Austria.



The results of the current study show the need for action in order to increase the quality of learning assignments applying ERP-Systems according to the status of research. To foster domain specific competences, learning assignments for levels 3 and 4 – i.e. design and reflection – should be created. Furthermore, learning assignments should be designed that foster other than domain specific competences as well. The results in the categories related to openness suggest designing learning assignments without explicit problem description and which force students to find viable approaches for problem solving themselves. In order to increase reference to everyday life, learning assignments should be created that require reflection of experiences with ERP-Systems in classroom lessons and ideally in a practice firm or virtual enterprise. Offering more learning assignments with references to crosslinking and comprehensive business processes would help increase students' awareness of the impacts particular transactions within an ERP-System can have on other processes within the whole process landscape.

In order to put these recommendations into practice as a next step, the development of learning assignments which take the above recommended requirements into account is required. To make the new learning assignments accessible to a multitude of students at commercial colleges, they should ideally get published in textbooks. Therefore, a tight collaboration with textbook publishers A and B is necessary. Innovations in education are most successful when being implemented by means of learning materials like textbooks (Dubs, 2012, p. 21).

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