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PROBLEMS IN UNDERSTANDING PROCEDURAL LEARNING

Abstract: In Slovenia, there has been a considerable confusion regarding the concepts and terms used to denote procedural knowledge. Through an analysis of the curriculum of primary teaching subjects and basic study literature on educational psychology and didactics we have concluded that each subject field has a different name for procedural learning. An examination of primary teaching students' knowledge in their fourth year of study showed that they have many difficulties with differentiating knowledge types and also with lesson planning to attain procedural learning objectives. In the academic years 2011/12 and 2012/13, a research on primary teaching students' progress in understanding and use of knowledge on procedural learning objectives was conducted through practical exercises of didactics of social sciences. We used the qualitative and descriptive non-experimental quantitative method of educational research. Thirty-six students participated in the research in the first year and thirty-one in the second year. The students answered the same question(s) prior to the practical exercises and after it. During seven weeks of practical exercises, the students achieved progress in identifying procedural objectives and planning lessons with an emphasis on procedural objectives, but many still misunderstand different types of knowledge and learning objectives. For a better knowledge of students, greater cooperation of the general educational sciences and didactics is imperative. Based on the experiences, we assume there are many other terminological differences in basic educational concepts between the educational sciences that cause unnecessary confusion among students.

Keywords: procedural knowledge, learning activities, social studies, classroom teaching.

INTRODUCTION

Starting with the first year, students of primary education of the Faculty of Education, University of Ljubljana, acquaint themselves with both pedagogical and specialised content-oriented teaching subjects. As the correlation between pedagogical and specialised content-oriented studies is especially evident at the Department of Primary

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Education, it seems reasonable to expect that after three years of studies and seven weeks of practical pedagogical training fourth-year students will know and understand the basic pedagogical and didactic concepts, so that the nature of and distinction between various types of knowledge and learning objectives should pose no major problems. However, this is not the case. Distinguishing between learning objectives with regard to types of knowledge, operationalization of learning objectives and lesson planning with regard to learning objectives prove to be extremely difficult tasks for many students at the beginning of their fourth year. Given that the students showed the greatest lack of comprehension through their conceptions of procedural knowledge and procedural learning objectives, we have tried over the last two academic years to find the reasons for this lack of comprehension.

Definitions of procedural knowledge

Knowledge is defined in various, often contradictory ways. Most frequently, it is described by types of knowledge. Over the last decades, it has often been defined as a combination of declarative (content, material), process (procedural, functional, formative) and strategic (conditional) knowledge. The Slovenian major document of educational policy White Paper provides a broad concept of knowledge. Although nowhere clearly defined, it consists not only of content knowledge, but also of "values, beliefs, capacity of practice, etc." (Bela knjiga 2011, p. 23)

Uniform conception of knowledge in the Slovenian language is also indicated by the fact that it is used in singular form. Thus, as Štefanc writes (2011, p. 116) "every type of knowledge conveys a declarative as well as procedural, strategic and value dimension, being as *knowledge* always inevitably substantial." However, regardless of the close interrelation and interaction of various components of knowledge, understanding individual components is useful for teaching, since learning process may vary as well. Therefore, teachers may benefit greatly from various classifications of knowledge; they improve our understanding of learning and thus help us plan it more easily and manage the learning process better, even though the taxonomies of knowledge merely represent more or less realistic models. Students, future teachers, should learn different taxonomies of knowledge and distinguish between learning objectives by types of knowledge. They should include various types of learning objectives in the teaching process and endeavour to attain diversified and optimally balanced knowledge, in order to make the "knowledge acquired by pupils permanent and applicable in various situations" (Bela knjiga, 2011, p. 26).

The paper at hand focuses above all on procedural learning objectives and the procedural component of knowledge. Process (procedural, functional) knowledge "consists of procedures for the use of knowledge in certain processes or routines and is demonstrated by appropriate practical activities" (Rutar Ilc, 2003, p. 16), "is the knowledge of knowing how" (Marentič Požarnik, 2000, p. 161; Marzano & Kendall, 2007, p. 28). Štefanc (2011, p. 116) extends the definition or, rather, links it to other components of knowledge: "Every kind of process knowledge is (implicit or explicit) knowledge of how to implement some process, whereby the implementation of a certain process never takes place only at a formal level, as it is always inscribed with the content that is the

subject of processing." This definition is congruent with Marzano's and Kendall's view (2007).

Mental activities are processes acquired through learning. With the exception of recognition and recall, which are both innate processes, Marzano and Kendall (2007, pp. 36–37) state that all other mental activities (processes) are acquired through learning. This they explain by presenting types and functions of memory: sensory memory stores momentary sensorial data, permanent memory stores everything that contains knowledge in the broadest sense of the word, and working memory is where the data from both sensory and permanent memory are actively used and processed. As long as we pay conscious attention to the data stored in working memory, the latter stays active. Marzano and Kendall quote Dennett's argument that "our experience of consciousness is actually our experience of what is being processed in working memory at any given point in time." As a rule, we must understand the data in order for the process to be effectively implemented (Ibid., p. 36).

Procedural learning differs from learning declarative knowledge. According to Marzano and Kendall (2007, pp. 29–30), mental procedures involved in procedural learning take place in three stages: the first is the cognitive stage, where the pupil puts the procedure into words and is only partly capable of implementing it, by relying on speech. In the second stage, also called the associative stage, the performance of the procedure is smoothed out. At this point, errors in the initial understanding of the procedure are detected, and the pupil no longer needs verbal support. During the third or the autonomous stage, the procedure is refined and becomes automatic. With regard to whether or not the procedure leads to automatic implementation, Marzano and Kendall classify mental procedures into two major groups: those that may be automatized through practice or implemented without much attention – they call them skills – and complex procedures that have a diversity of possible outcomes and involve many interrelated subprocedures are referred to as macroprocedures.

Terminology used for procedural knowledge in study literature for students and in primary-school curricula

From the list of mandatory study literature for students of primary education related to the subjects Didactics and Educational Psychology at the Faculty of Education in Ljubljana, we have analysed two works of basic literature for each subject: *Didaktika* (Blažič et al., 2003), *Didaktika – Osrednje teoretične teme* (Strmčnik, 2001), *Psihologija učenja in pouka* (Marentič-Požarnik, 2000) and *Pedagoška psihologija* (Woolfolk, 2002).

Didactics deal with material, informative knowledge (knowing – I know) on one hand and with formative, formal, functional knowledge (knowledge – I can) on the other; the main objective of formative knowledge is to teach the youth how to learn (Blažič et al., 2003, pp. 55–56; Strmičnik, 2001, pp. 59–78).

In educational psychology (Marentič-Požarnik, 2000, pp. 161–162, Woolfolk, 2002, p. 194), students learn about the division of knowledge into declarative (know that ...), procedural (know how …) and strategic (know when …). Marentič-Požarnik, however,

lists an additional subcategory of strategic knowledge – metacognitive knowledge. Marentič-Požarnik places a great emphasis on teaching how to learn as well.

The conclusions of the analysis of terminology for procedural knowledge in curricula for seven primary education subjects are shown in Table 1.

Table 1: Terminology for procedural knowledge in curricula for the 1st–5th grade of primary school

Subject	**Procedural knowledge**
Society	Knowledge in the field of activity
Environment	Procedures (skills)
Natural sciences and engineering	Procedures and skills
Music	Abilities and skills
Slovenian language	Capacities/competences; capabilities and skills
Mathematics	Competences
Physical education	Practical contents

As we can see, every field uses a different name for procedural knowledge in the curriculum for its subject. The term procedures appears twice, the term skills four times, competences, capacities, abilities, capabilities, practical contents and knowledge in the field of activity once each.

Given that specialised didactics participated in the preparation of all curricula, we assume that this is also the terminology the students learn when studying individual subject didactics. Not surprisingly, then, they are confused and face problems giving a name to and understanding procedural knowledge, since every single one of the eight analysed fields – general didactics, educational psychology, special didactics of social sciences, natural sciences, music, Slovenian language, mathematics and sports – uses a different terminology.

Research objectives and research questions

Within the framework of practical exercises at school during the course of didactic of social sciences, our major emphasis over the last three years has been on the pupils' procedural knowledge in the classroom. The students had to include procedural learning objectives into the instruction and determine the pupils' progress in performing a selected activity. Since this posed an enormous amount of problems, we examined closely the students' knowledge on procedural knowledge, procedural objectives and methods of teaching them.

In the academic year 2011/2012, we were interested in:

- how the students planned to teach procedural objectives in social sciences, and
- whether and how the acquired knowledge affected the planning of the teaching of procedural objectives at the practical exercises at school during the course of didactic of social sciences.

In the academic year 2012/2013, however, we established:

- how the students defined procedural objectives;
- whether and how the acquired knowledge affected the definition of procedural objectives;
- what types of learning objectives they recognised as procedural learning objectives;
- whether and how the acquired knowledge affected the recognition of procedural learning objectives.

Methodology

Basic research method

We used the qualitative, descriptive and non-experimental quantitative method of educational research.

Sampling description

We used the non-probability and convenience sample of students. In each generation we selected two out of six groups of fourth-year students of the Department of Primary Education – i.e. the two that had their practical exercises of didactic of social sciences at school in the first part of the winter semester. Thirty-six students participated in the research in the first year and thirty-one students in the second.

Data collection procedure

We collected the data by means of a questionnaire we had drawn up ourselves. In the first year, it only contained one open-ended question with five fields for answers. In the second year, however, the questionnaire contained one open-ended question and nine close-ended questions with a dichotomous selection. The students answered the same question(s) prior to the practical exercises of didactic of social sciences and after the exercises. The questionnaire was carried out directly.

Data processing procedure

The answers to the open-ended questions were analysed qualitatively. The analysis included open coding and categorisation. For the latter, we used classical didactic steps of thematic planning of instruction: 1. Introduction, assessing prior knowledge, 2. Treatment of new subject matter, 3. Exercise, repetition, and consolidation, 4. Assessing, evaluating. We have selected this analysis because the students acquainted themselves with it and used it in the planning of their teaching lessons within the framework of the didactics of social sciences.

For the analysis of results of the close-ended questionnaire with a dichotomous selection, descriptive statistics were used.

Demonstration and interpretation of results

Planning of instruction with an emphasis on procedural objective

Planning and monitoring pupils' progress in attaining a reasonably selected procedural objective was one of the students' tasks in teaching the thematic cluster in six consecutive weeks of their practical exercises at school. As the students evidently

experienced major problems with this, we aimed to focus their attention to the said objective also by assessing their prior knowledge and by announcing a test of the progress they had made in planning the instruction of procedural knowledge acquisition. Thus, they experienced instruction with procedural learning objective on two levels – both as pupils and as teachers. At the same time, we assessed the effectiveness of our tasks within the framework of practical exercises of social sciences. The quality of a student's planning of instruction with a view to attaining process objectives was assessed by means of the following task performed before and after the practical exercises at school.

Plan five hours of fourth-grade instruction in social sciences to attain one of the following procedural objectives: a) the pupil is able to uphold his or her opinion with arguments or b) the pupil is able to create a mind map.

The students more often decided to plan mind map instruction (26 students out of 36 before the practical exercises and 22 students after the practical exercises at school), despite the fact that in the previous academic year we had dedicated one assignment to teaching argumentation and had not dealt at all with mind maps in the didactics of social sciences.

Since the analysis of the answers of students who planned to teach creating mind maps showed significant differences between the two implementation groups of students, we shall present the results by groups.

The planning to teach mind maps creation in the first group before the practical exercises at school is well demonstrated by the lower example, which is one of the better products.

Table 2: An example of planning of teaching mind map (MM) creation in the first group before the practical exercises at school.

Learning unit	Student m.	Codes	Categories
1.	*During the assessment of prior knowledge (of some subject), the pupils arrange their ideas into MMs.*	Assessment of prior knowledge	Assessment of prior knowledge
2.	*We write the new subject matter on the blackboard as a MM; the pupils copy it into their notebooks, while I draw their attention to the characteristics and the form that the MM should have.*	Demonstration, characteristics and form of MM	Dealing with a new subject matter
3.	*The pupils make MM posters divided into groups and each group presents its MM.*	Exercises by groups	Exercises
4.	*Each individual pupil draws a MM in their notebook. We assess and correct their products.*	Individualised exercise Assessment Feedback information	Exercises Assessment
5.	*Each individual pupil reads their own MM as part of an assessment assignment.*	Evaluation of knowledge	Evaluation

Most students in this group used a general model in planning the preparation of the above mentioned subject, which they learned during the practical training in didactics of social sciences and probably also in other subjects. As the same model was also used in planning the teaching of "argumentation", we shall not present it in detail here.

After the practical exercises at school, a lesser number of students (11) of the first group chose to plan to teach mind maps. Since the questionnaire was anonymous, we cannot know how many of these students also opted for mind maps before the practical exercises. The table below demonstrates the results by didactic categories before and after the practical exercises at school. The general pattern of planning remained the same.

Table 3: Inclusion of didactic categories of the first group's thematic planning before and after the practical exercises at school

DIDACTIC CATEGORIES		Before (N = 16)	After (N = 11)
Assessment of prior knowledge	Functional prior knowledge	6	6
	Declarative prior knowledge	4	
Teaching	Demonstration and characteristics of MMs	12	11
	Comparison of MMs and their characteristics	4	
Feedback information to pupils	During assessment of prior knowledge	2	2
	During learning	3	6
	During assessment of knowledge	4	4
Exercises	Frontal	18	16
	Group	13	7
	Individual	14	19
	Average number of created mms	2.8	3.73
Evaluation	Declarative knowledge	1	
	Functional knowledge	3	5

The assessment of prior knowledge after the practical exercises was included in the plan of a relatively smaller number of students (8%). The teaching was still predominantly based on demonstration. However, major progress was achieved by including feedback information to pupils in the planning process – from 56% before the practical exercises to nearly all the students after the practical exercises. After the practical exercises, the students planned less group work and placed much more emphasis on individual creation of mind maps, with the average number of mind maps per pupil rising from 2.8 to 3.7. Slightly less than one half of the students evaluated the use of mind maps after the practical exercises and one fifth did the same before the practical exercises. What may be considered as a positive shift in the students' knowledge was their awareness of the significance that feedback information has on the pupils' learning, the importance of the pupils' independent, individual activities, as well as implicit conception that it is possible to evaluate also the attainment of procedural objectives or, rather, functional knowledge.

Judging from the results, the students failed to give due importance to assessing the pupils' prior knowledge.

Based on the results produced by the second group of students we have established that they had the knowledge of some specific procedures of teaching the creation of mind maps. They started the instruction by teaching identification of key words and only then passed onto the creation of mind maps. The example below shows a typical product of the second group of students.

Table 4: An example of planning of teaching the creation of mind maps in the second group before the practical exercises at school.

Learning unit	Student P.	Codes	Categories
1	*I read the description of animals to the pupils. I ask what they have remembered and tell them to make brief notes. This can be done with key words arranged into a mind map. We talk about the uses of mind maps.*	Listening, selecting key words, demonstration of MMs, uses of MMs	Teaching a new subject matter
2	*I present the contents of a mind map. The pupils exercise noting down key words. Together we create a mind map for an animal presented during the first hour.*	Characteristics of MMs, exercise in noting down key words, frontal creation of a MM	Teaching a new subject matter
3	*The pupils obtain key words which they have to arrange in a mind map so as to make up meaningful units, hypernyms/hyponyms (e.g. APPEARANCE: long tail, small ears…).*	Arranging key words, hypernyms, hyponyms	Exercise
4 and 5	*The pupils, divided in groups, create a mind map on the basis of a given text. Later on, this mind map will also help them make their presentation of the text in front of the class.*	Group creation of MMs, presentation of contents	Exercise

Key words in the students' products are connected above all with the procedure of teaching a new subject matter (demonstration, characteristics of mind maps, writing out key words, hypernyms, hyponyms) and with practicing the procedures (arranging key words, creating mind maps); it does not include other didactic levels of instruction. The latter, however, does not apply to all students, as is evident from the table below.

Table 5: Inclusion of didactic categories of thematic planning by the second group of students before and after the practical exercises at school.

DIDACTIC CATEGORIES		Before (N = 11)	After (N = 16)
Assessment of prior knowledge	Functional prior knowledge	2	3
	Declarative prior knowledge	4	3

Teaching	Key words from the text,	5	7
	demonstration and characteristics of MMs	8	7
	Characteristics	0	4
Feedback information to pupils	During assessment of prior knowledge	0	0
	During learning	0	0
	During assessment of knowledge	1	0
Exercise	Frontal	15	16
	In groups	5	7
	Individual	14	24
	Average number of created mms	3.1	2.9
Evaluation	Declarative knowledge	0	0
	Functional knowledge	0	3

A little more than one half of students planned the assessment of prior knowledge before and only a little more than one third after the practical exercises at school. Before and after the practical exercises, slightly less than one half of students included identification of key words in the text and arranging of key words in teaching the creation of mind maps, hypernyms and hyponyms are also mentioned. Most students, but not all of them like in the first group, planned to demonstrate a mind map and learning its characteristics. On average, the students planned a similar number of exercises before and after their practical exercises, and the pupils made three mind maps on average. Frontal instruction was most often planned before the practical exercises and individual instruction became more frequent after the exercises. Assessment of knowledge (providing the pupils with feedback information) was included in the planning only once and evaluation of knowledge was included three times. In this group, the pattern of planning the teaching of mind maps at the practical exercises at school of the didactics of social sciences remained unchanged.

The students of the second group failed to establish a link between the thematic planning by general didactic stages of instruction (assessment of prior knowledge, teaching, exercises, assessment, evaluation) and the model of teaching mind maps (identifying key words, learning the form and meaning of mind maps, doing exercises in making mind maps). Interestingly these students successfully applied general didactic stages of instruction in their practical exercises in attaining content objectives. We can only speculate about the reasons for this: perhaps the planning framework comprising five learning units was too short, perhaps they did not pay close enough attention to the assignment because of its anonymity; perhaps they had problems establishing a link between models – i.e. the model of teaching mind maps and the model of didactic planning of a thematic cluster.

How the students conceive of procedural knowledge

The following academic year we investigated the work of the next generation of students within the framework of practical training as part of didactics of social sciences. With the aid of a questionnaire, we aimed to determine the knowledge of procedural objectives before and after the practical exercises. According to the students, the main

characteristic of procedural knowledge is the knowledge a pupil acquires over a longer period of time. Their answers were closer to the conception as presented by Kramar (2013, p. 32), who, regardless of the type of knowledge, sees the procedural nature of objectives as a didactic dimension of any objective that "emerges in the process and is a dynamic phenomenon subject to change (expanding, deepening, improving, etc.)".

Table 6: Definitions of procedural knowledge as set by 31 students before and after the practical exercises at school.

STUDENTS' DEFINITIONS Procedural knowledge is …	Before practical exercises	After practical exercises
Knowledge acquired by a pupil over a longer period of time	26	28
Knowledge of skills, capabilities, activities	2	0
Knowledge of procedures, strategies	2	2
Life knowledge	1	0
Pupils learn through activity/experience …	0	7
Dealing with various contents	0	2
Knowledge that may be upgraded, enhanced	0	6
The need for activity, progress awareness	0	3
Total	31	48
No answer	3	0

The only difference between the initial and final assessment is that in the beginning 24 students only wrote that procedural knowledge was that for which a pupil needs more time to acquire. After the practical exercises, however, the majority of students extended this definition by some of the elements of methodical procedure of acquiring procedural knowledge: that pupils acquire it through activities, experiences, various contents; that they are able to upgrade it; that there is a need for an activity, progress awareness.

Before the practical exercises, it is possible to deduce a proper understanding from two answers (procedural knowledge as skills, capabilities, activities). After the practical exercises, however, greater awareness is shown about the need to make pupils active (7) in their acquisition of procedural knowledge, but it is impossible to conclude solely on this basis that the students understand that this is the knowledge about "how to do something".

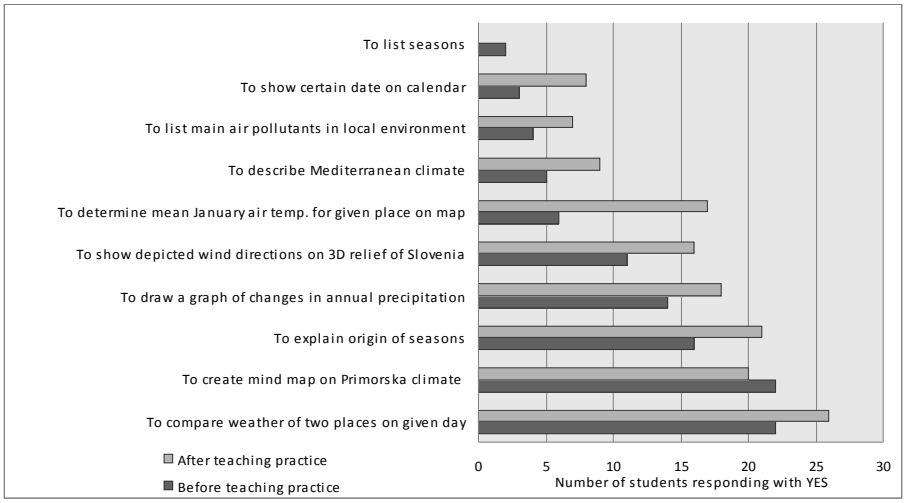
What learning objectives the students identify as procedural?

Procedural objectives constitute the largest number of learning objectives. Pursuant to Marzano's and Kendall's definition of mental processes, only two are declarative – *to list seasons of the year* and *to list the main pollutants*, by requiring merely knowledge recall. Activities such as describe, explain, define are often classified among Slovenian education professionals as activities defining declarative knowledge (e.g. V. Brodnik, 2003), even though these, too, include (description, explanation, etc.) skills. If, however, the

descriptions, the interpretations are learned routinely by remembering only, they require only knowledge recall.

Other learning objectives in the questionnaire involve the use of sources (calendar, map), transformation of data (from a verbal form into a graphic-kinetic form) presentation of data (mind map, graph) and mental processes (comparison, explanation).

Table 7: Learning objective identified as procedural objective before and after the practical exercises in the didactics of social sciences



During seven weeks of practical exercises, the students achieved progress in identifying procedural objectives. The students (31 respondents) identified none of the above indicated learning objectives as 100% procedural objectives, but agreed unanimously at the end of their practical exercises that enumerating seasons was not one of them. Interestingly, the activities most often identified as procedural were mental activities (comparison and explanation), followed by data presentation activities (creation of mind maps, graphic presentation); on the other hand, map reading was recognised as procedural knowledge by a significantly smaller number of students and calendar reading by even less. Although quite a few students taught map reading to pupils – hence notable progress – they were unable to transmit the same knowledge to calendar reading. It appears that the students' decision was mainly defined by the difficulty of the learning objective and the duration of learning. This is also evident from the difference between the objectives to enumerate seasons and enumerate air pollutants. Having recognised the latter as more difficult, more students classified it as a procedural objective. As they already stated in their definitions of procedural objectives, learning is a procedural objective when it demands more time. This points to a substantial misunderstanding of different types of knowledge and learning objectives.

CONCLUSION

Eight different terminologies in seven curricula and two study subjects point to the unconnectedness between individual scientific areas, to the little impact that both educational psychology and general didactics have on special didactics of primary education subject areas, as well as the lacking cooperation between special didactics. Although we have only analysed one concept, the experience shows that there are many other similar terminological as well as notional and conceptual incongruences.

There is not only a need but an urgent necessity for a dialogue between various educational subjects, as well as the unification of the terminology of basic educational notions and concepts. Professional and scientific cooperation should begin at least within the framework of individual educational institutions and in relation to curricula. This is especially important on the primary education level where teachers use curricula of different subject areas. As we have learned from practical experience, many teachers face similar problems in understanding procedural objectives as students of primary education. Whereas a complete unification of terminology may not be reasonable due to different connotations conveyed by various terms, argumentation of differences, especially emphasis on and recognition of content equality is highly desired.

Division of knowledge into individual components or types has its origin in various types of learning and teaching individual types of knowledge. It is important for future teachers to learn and understand these differences already on the level of the processes of learning and teaching. Then they will find it easier to tackle different terminologies for types of knowledge and learning objectives in individual primary education subject areas. It is important to be aware of terminological confusion and various interpretations of the basic terms and to make an effort to overcome these obstacles in interdisciplinary discussions, as they affect instruction and consequently also pupils' knowledge.

LITERATURE

- *Bela knjiga o vzgoji in izobraževanju v Republiki Sloveniji* (2011), eds. Krek, J. and Metljak, M. Ljubljana: Zavod RS za šolstvo
- Brodnik, V. (2003). Uvod. *Model letne delovne priprave za osmi razred devetletke* http://www.sistory.si/publikacije/prenos/?urn=SISTORY:ID:721 (9 January 2013)
- Kramar, M. *Didaktika*. http://splet-stari.fnm.uni-mb.si/pedagoska/kramar/files/Popravljen%20dvojnikpopravljen%20did..pdf (14 March 2013)
- Marentič-Požarnik, B. (2000). *Psihologija učenja in pouka.* Ljubljana: DZS
- Marzano, R. J., Kendall, J. S. (2007). *The New Taxonomy of Educational Objectives.* Thousand Oaks: Corwing Press
- Strmičnik, F. (2001). *Didaktika. Osrednje teoretične teme.* Ljubljana: Znanstveni inštitut Filozofske fakultete
- Štefanc, D. (2011). Pojmovanja znanja v pedagoškem diskurzu: nekateri problemi. *Sodobna pedagogika, 62* (1), pp. 100–119
- *Učni načrti. Program osnovna šola, Družba.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo

- *Učni načrti. Program osnovna šola, Glasba.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- *Učni načrti. Program osnovna šola, Naravoslovje in tehnika.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- *Učni načrti. Program osnovna šola, Slovenščina.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- *Učni načrti. Program osnovna šola, Spoznavanje okolja.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- *Učni načrti. Program osnovna šola, Šport.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- *Učni načrti. Program osnovna šola,Matematika.* (2011) Založništvo in izdelava Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo
- Woolfolk. H. A. (2002). *Pedagoška psihologija.* Ljubljana: Educy.

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