

# ABILITY TO LEARN OF STUDENTS ENTERING THE FACULTY OF MATERIALS SCIENCE AND TECHNOLOGY

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## Abstract

*The article is the output of the small research which was done as a part of introductory course- Introduction to University Study - provided by Institute of Engineering Pedagogy and Humanities, for students entering the Faculty of Materials Science and Technology of the Slovak University of Technology (MTF STU) in the academic year 2008/2009. Effective learning strategies based on reading were introduced and practiced during this introductory course. The students were asked to read 4 pages of study material with the topic focused on water energy and water power-stations plants and environmental problems necessary to deal with. Students read same study material and they used different reading strategies. After reading the materials they did the test and 126 randomly chosen students' works were analyzed.*

## Key words

*reading literacy, reading strategies PLAN, RAP, SQ3R, KWL, learning style, ability to learn (learning ability)*

## Introduction

Ability to read and to learn by reading is a basic academic skill that is important for school success in all areas of study and at all educational levels. The issue of this article covers the area of reading literacy of university students and related study skills (learning ability) and study results.

- Suitable study texts and papers and adequate study strategies develop the aptitude for
- using language, symbols and texts interactively,
  - communicating accordingly, hearing actively, reading and understanding a coherent text
  - understanding graphs, diagrams, charts,
  - developing aptitude for applying mathematical knowledge and skills operationally,

- developing the ability to use knowledge and information interactively – to know how to search, classify and use data, to think critically, to be able to express own opinion
- applying logical operations, being able to solve problems,
- using the technology interactively – make use of information-communication technologies and media, to be able to use technical conveniences in daily life, so develop the ability to learn [1].

Results of international comparative studies, e.g. PISA/ OECD indicate weak points in presented knowledge and skills of Slovak students. In consequence of this situation students with missing basic reading skills and strategies are entering the universities and therefore it is often difficult for them to get under control a large-scale study of diversified documents. Underdeveloped reading literacy can result in failure or weak study results [2].

All advanced countries pay attention to guiding pupils and students to use the efficient reading strategies because the reading literacy is considered to be a key competence and has to be developed at all education levels and in appropriate way. Technical University in Copenhagen (DTU) was engaged in research of study strategies and manners of the first year students and inter alia they found out that Danish students of the Technical University study by reading only in 9 % of time what was substantially less than expected. Research authors stated that their students should be more involved in authentic learning and they should solve real engineering problems not only book examples. Improvement of education quality in DTU should become the target of structural changes implemented on the basis of this research [3].

Specialists from many well-known universities of the world present in „Journal of College Reading and Learning“ (JCRL) research results in the area of reading skills and study abilities improvement of their students.

As the authors (4) of the article: The effectiveness of strategic reading instruction for college developmental readers (JCRL, 09/2004) said, success in college depends to a considerable degree upon students' ability to engage in strategic reading of extensive academic or informational text. Such students have difficulty discerning important from unimportant information; selecting, organizing, and interpreting multiple texts; this article introduces methods of strategic reading development as they were defined through several reviews of the research. Important aim of such researches is to evaluate the ability of students to transfer strategic reading skills to subsequent, authentic college tasks e.g. research of Boylan, Bonham, White, & George, 2000; Simpson, 2002.

The article discusses findings of reading strategies (SQ3R, PROR, PLAE, PLAN) – algorithmic and heuristic oriented – more or less successful, realized in a form of stand-alone courses. Strategic reading instruction also has been examined when taught as a course linked to a challenging, core-academic course.

The **SQ3R** method [5]

The SQ3R method has been a proven way to sharpen study skills. SQ3R stands for Survey, Question, Read, Recite, and Review.

Survey - get the best overall picture of what you're going to study BEFORE you study it. It's like looking at a road map before going on a trip.

Survey the chapter: the title, headings, and subheadings, captions under pictures, charts, graphs or maps, review questions or teacher-made study guides, introductory and concluding paragraphs, summary.

Question - ask questions for learning. The important things to learn are usually answers to questions. Questions should lead to emphasis on the what, why, how, when, who and where of study content.

**Q**uestion while you are surveying: Turn the title, headings, and/or subheadings into questions;

**R**ead - Reading is NOT running your eyes over a textbook. When you read, read actively. Read to answer questions you have asked yourself or question the instructor or author has asked.

**R**ecite - orally ask yourself questions about what you have just read or summarize, in your own words, what you read, take notes from the text but write the information in your own words, underline or highlight important points you've just read.

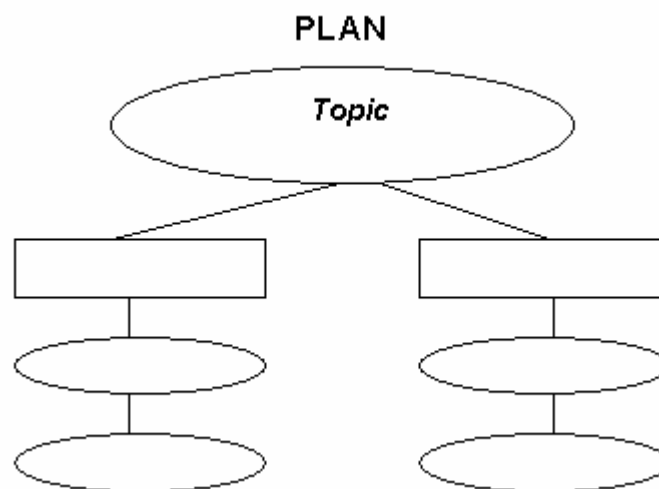
**R**evision - orally recite or write the answers from memory. Develop mnemonic devices for material which need to be memorized. Recite the information orally and in your own words.

## PLAN

The Predict-Locate-Add-Note [6] graphical organizer helps students summarize the content of a reading selection. This instrument incorporates a number of reading and learning strategies into a single note-taking tool.

Using the PLAN organizer students:

- **Predict** selection content based on prior knowledge and experiences.
- **Locate** familiar and unfamiliar words and concepts.
- **Add** new information to prior knowledge.
- **Note** how new information can be applied to everyday tasks.



Fritz, Margaret [7] in the article: Using learning styles inventories to promote active learning (JCRL, March 2002) describe results of using K-W-L reading strategy. The dilemma of many professors is how to introduce active learning in a traditional lecture course. **K-W-L**, a reading strategy, which promotes active reading, is adapted to facilitate active learning in the traditional lecture classroom. This strategy facilitates critical thinking, professor-student interaction and retention in the course and in college. I Want to Know -What I Learned (K-W-L), at the beginning and end of each unit taught in a college lecture course. The traditional K-W-L reading strategy can be adapted to transform the traditional lecture class to an interactive. Important conclusion of this research is, that K-W-L, as an active learning strategy, allows the students who feel invisible or marginalized in college classrooms an opportunity to contribute in classes too large for verbal interaction with the professor. One of

the advantages of active learning is that it appears to benefit all students. This strategy promotes active learning through reading, writing, discussing and/or problem solving.

Authors [8] of the article: Study strategies and generative learning: what works? (JCRL, September 2006) state, that students use many different strategies when reading and studying text-based material, although some strategies produce better results than others. The study, presented in article, demonstrates that certain study strategies are more effective than others when learning from authentic text material. Study techniques that require the student to generate information (e.g. generate questions and take notes) appear to be more effective than those limited to reading and highlighting or a combination of both. Even though generative strategies may take students more time than some strategies that do not require generation, their greater effectiveness is not solely related to more time-on-task since time-on-task was the same for all four groups in this study. There are also a number of other reasons why the generating-questions strategy (**RAP- Read, Ask question, Paraphrase**) might be effective.

First, it requires students to identify the important information, an essential active reading skill.

Second, as students generate questions they frequently rephrase the information making it more personally meaningful and, therefore, more memorable (Doctorow, Wittrock, & Marks, 1978; Wittrock, 1974).

Third, as students underline the answers to the questions that they generated, they benefit from repetition of that important information.

Fourth, students then review by self-testing using their generated questions which allows them to effectively monitor their learning and understanding (Van Blerkom & Van Blerkom, 2004). Finally, students practice using cues in the generated questions and in the text material which allows them more easily retrieve answers to the questions.

### **Methodology**

Before beginning study at the MTF STU students have to attend lectures and seminars focused on effective learning strategies. The best learning and study strategies are introduced and practiced. In the year 2008 all freshmen were asked to read study text with information about water energy and water power-stations. The text contained text, graphs, tables, pictures, and numerical data. Students had to study the same text but with different reading strategies: SQ3R, PLAN, RAP and KWL. There was one check-up group (KS) without certain reading strategy. After 20 minutes the students involved in reading took the same test. Other variables for statistic work were: sex, type of high school- academic, professional or vocational oriented and personally preferred learning style. The 126 randomly chosen tests for students, were taken as a sample for small research.

Aim of research:

- To find out the effective reading strategy for technical oriented university study as a basic framework for creation of the study materials by university teachers

Tasks:

1. To identify reading strategies appropriate for university students.
2. To prepare introductory lecture and exercise.
2. To prepare suitable text and test.
4. To make statistic analysis and conclusion fulfill the aim.

## Results and discussion

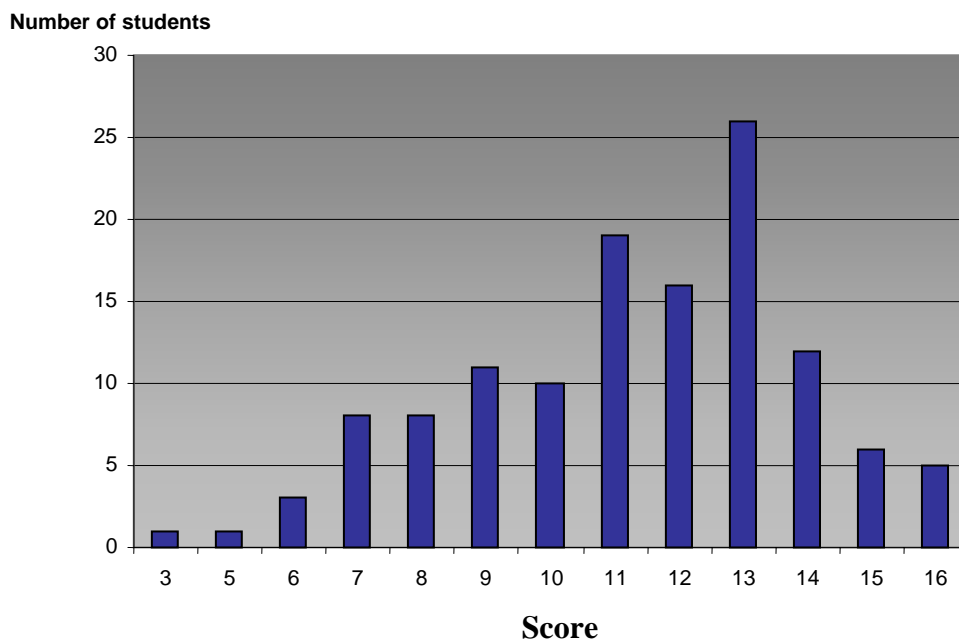
Score	Number of students	%
3	1	0,8
5	1	0,8
6	3	2,4
7	8	6,3
8	8	6,3
9	11	8,7
10	10	7,9
11	19	15,1
12	16	12,7
13	26	20,6
14	12	9,5
15	6	4,8
16	5	4,0
<b>total</b>	<b>126</b>	<b>100,0</b>

Maximum score: **20**

Maximum achieved score: 16 (80 %)

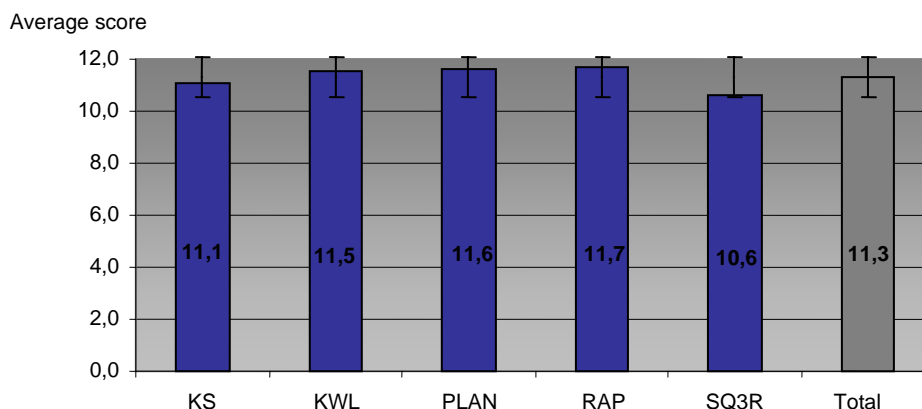
Score of 13 points (65 %) was achieved by 26 students- highest number of the students of sample.

Bar chart



Reading strategy	Number of students	%	Average score
KS	26	20,6	11,1
KWL	25	19,8	11,5
PLAN	23	18,3	11,6
RAP	25	19,8	11,7
SQ3R	27	21,4	10,6
<b>Total</b>	<b>126</b>	<b>100,0</b>	<b>11,3</b>

The lowest score was achieved by SQ3R reading strategy. The highest score was achieved by RAP reading strategy.



Sex	Number	%	Average score
Men	80	63,5	11,4
Women	46	36,5	11,1
<b>TOTAL</b>	<b>126</b>	<b>100,0</b>	<b>11,3</b>

There is not significant difference between average score of men and women.

School	Number	%	Average score
GYM	43	34,1	11,2
SOS	6	4,8	9,3
SPS	61	48,4	11,6
SOU	16	12,7	10,9
<b>SPOLU</b>	<b>126</b>	<b>100,0</b>	<b>11,3</b>

Types of high schools from which students graduated:

Gym - gymnázium (academic oriented high school)

SOS - stredná odborná škola (professional oriented school- e.g.accounting)

SPS - stredná priemyselná škola (technical oriented high school)

SOU - stredné odborné učilište (vocational oriented high school)

Students had graduated at SOS they achieved the lowest average score, but there were only 6 students in a sample.

The most of students at MTF STU are graduates from SPS. They achieved the highest average score.

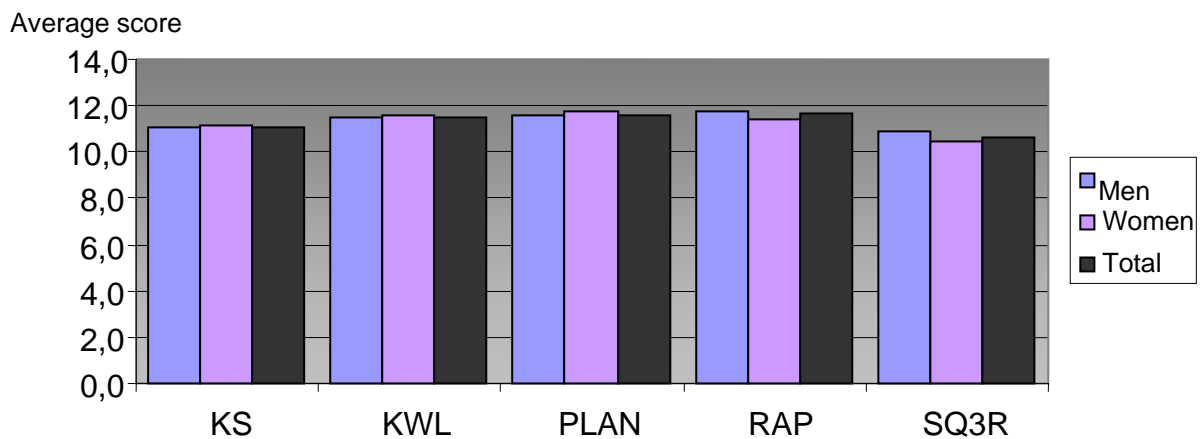
Preferred learning style	Number	%	Average score
<b>Auditory</b>	30	23,8	12,0
<b>Kinesthetic</b>	12	9,5	10,6
<b>Visual-pictures</b>	39	31,0	11,5
<b>Visual- words</b>	45	35,7	10,9
<b>TOTAL</b>	126	100,0	11,3

A learning style is a way of learning. Preferred learning style is personally the most effective way of learning. Three basic learning styles that are often identified by students are: the **Auditory Learning Style**, the **Visual Learning Style** (more pictures or words preferred), and the **Tactile/Kinesthetic Learning Style** [9].

The best score was achieved by students' preferred audio study style. Identification of the preferred study style was subjective and came up from own personal opinion.

Reading strategy	Number of Students			Average score		
	Men	Women	Total	Men	Women	Total
<b>KS</b>	18	8	26	11,1	11,1	11,1
<b>KWL</b>	18	7	25	11,5	11,6	11,5
<b>PLAN</b>	16	7	23	11,6	11,7	11,6
<b>RAP</b>	18	7	25	11,8	11,4	11,7
<b>SQ3R</b>	10	17	27	10,9	10,5	10,6
	80	46	126			

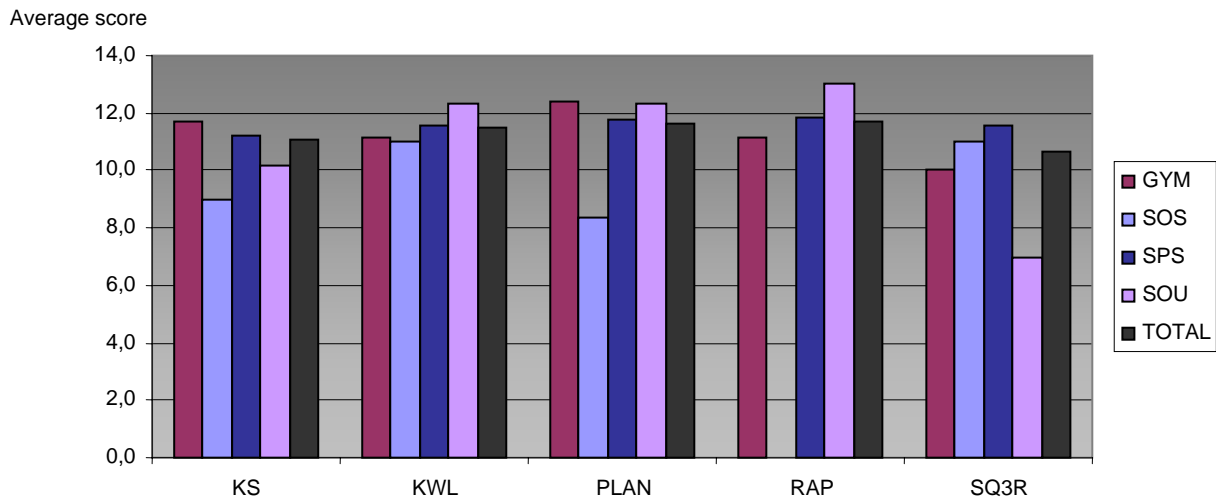
There are no differences between average score of men and women in certain reading strategy.



**Type of school**

Reading strategy	Number of students					Average score				
	GYM	SOS	SPS	SOU	Total	GYM	SOS	SPS	SOU	Total
<b>KS</b>	10	1	9	6	26	11,7	9,0	11,2	10,2	11,1
<b>KWL</b>	6	1	15	3	25	11,2	11,0	11,5	12,3	11,5
<b>PLAN</b>	8	3	9	3	23	12,4	8,3	11,8	12,3	11,6
<b>RAP</b>	9	0	14	2	25	11,1	0	11,9	13,0	11,7
<b>SQ3R</b>	10	1	14	2	27	10,0	11,0	11,6	7,0	10,6
	43	6	61	16	126					

Graduates of SOU achieved the lowest score after study by SQ3R reading strategy, and the highest score by RAP reading strategy. The students from SOS were less successful after study of PLAN reading strategy. Students graduated at GYM. achieved the highest score after study of PLAN reading strategy and SPS students achieved balanced score in every reading strategy.



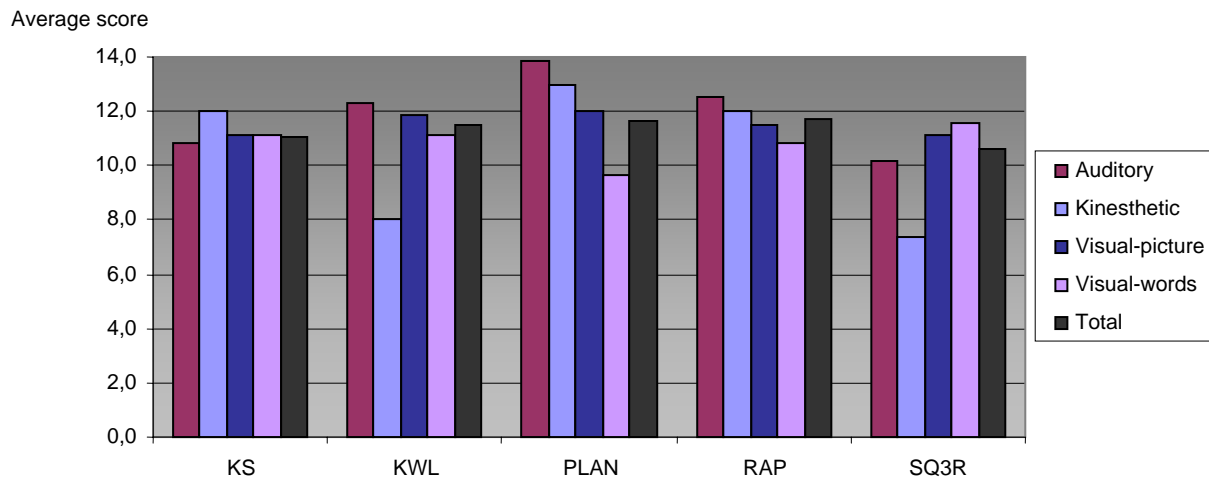
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Reading strategy	Number of students					Average score				
	Audio	Kinetic	Visual-picture	Visual-words	TOTAL	Auditory	Kinesthetic	Visual-picture	Visual-words	TOTAL
<b>KS</b>	5	1	10	10	26	10,8	12,0	11,1	11,1	11,1
<b>KWL</b>	7	1	7	10	25	12,3	8,0	11,9	11,1	11,5
<b>PLAN</b>	6	1	7	9	23	13,8	13,0	12,0	9,7	11,6
<b>RAP</b>	6	6	6	7	25	12,5	12,0	11,5	10,9	11,7
<b>SQ3R</b>	6	3	9	9	27	10,2	7,3	11,1	11,6	10,6
	30	12	39	45	126					



The reading strategy PLAN achieved the highest average score in groups of student with preferred auditory, kinesthetic and visual-picture study styles.



## Conclusion

Reading literacy is the key competence which should be developed at all educational levels. Ability to read and study by reading is the basic academic skill. Small research based on reading literacy of students beginning study at the MTF STU showed weak reading skills of students in general (very low test score). Used reading strategies seem to be appropriate for university students – heuristic method of learning (PLAN), active learning by KWL and RAP. SQ3R reading strategy based on logical steps was the less successful and the most time consuming strategy. Because of no difference between results of men and women in our sample of students, reading strategy PLAN, KWL and RAP is strongly recommended. Reading strategies mentioned above fulfill the requirements of different learning styles – auditory (KWL), kinesthetic (PLAN), visual (PLAN, RAP, KWL). The Students who graduated at the vocational oriented high schools generally have the lowest academic knowledge. Good balance between reading and practice could help them to achieve good academic outcomes. Detail description of reading strategies, study text and test mentioned in the article are available from the author.

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