Employing a marketing approach to create a learning environment for engineering student

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ABSTRACT

This paper investigates the engineering student's world, special needs and attitudes – during first year academic studies – from a marketing viewpoint. It examines students' attitudes regarding textbook reading and use of Internet sites as a supportive environment for basic courses. 134 college engineering students and 94 university engineering students participated in research relating to: reading habits before and during academic studies, preferred language for textbooks (English or Hebrew), reading skills and use of on-line learning materials. Findings indicated similar reading habits for college and university students, except for use of on-line learning materials and a significant correlation between pre-academic study reading habits and reading during academic studies. More than 90% of the students clearly prefer textbooks written in their mother tongue. The students rarely used textbooks to deepen understanding of course subjects, but thought they were very important for success in the courses. They were primarily assisted by textbooks for exercise solution. University students used on-line learning materials more often in comparison with the college students.

Keywords: learning environment, marketing, mother tongue, online learning, reading, textbook.

1. INTRODUCTION

Until two decades ago the textbook was one of the essential components of any basic science course. Today students are offered a variety of learning channels and most courses are accompanied by an on-line site, which usually displays presentations that were shown in the lectures, supplementary articles, video-clips, exemplary examinations etc. Studies in many world states indicate that only a small proportion of students read textbooks systematically during their studies, in their first years of higher education, even if the textbook is written in their mother tongue (Cummings, French & Cooney, 2002).

This paper deals with the identification of special needs and preferences of a specific student population segment (Kotler & Armstrong, 2006) - engineering students. It relates to the assimilation of new materials, in light of the teaching methods employed by the academic institute to instruct the students, the improvisations that students use as a suitable response for their needs and, more specifically, relates to the way in which they are helped by textbooks during their studies for their introductory courses.

Since these needs and preferences are examined in light of the teaching methods and the absorption of new materials, the research looked at the engineering students' attitudes at the inception of their academic studies, examining their textbook reading habits and their use of other available learning materials. Additionally, the study asked: to what extent is it desirable that the textbook or learning environment should be in the global language: English, or should it be available in the student's native language, in this case: Hebrew.

2. THEORETICAL BACKGROUND

2.1 The status of the textbook at the inception of academic studies

The typical Israeli student does not continue his/her studies in higher education institutes immediately after secondary school graduation, and only reaches higher education when most of the scientific knowledge and scientific thinking habits that were learnt in high school are barely accessible. Hence, revision is needed when beginning academic studies (Finegold & Pundak, 1990, 1991). This phenomenon is also prevalent in the USA where out of 17 million students who registered for higher education, only 18% began these studies immediately after secondary school, and more than 58% began academic studies after the age of 22 (Stokes, 2006). A study conducted by Bruning (2008) found that, in their first year of higher education, students find it difficult to read textbooks, since most of them do not have the necessary skills to organize and understand the ideas and terminology that appear in these books.

In basic science courses, an immense amount of material is learnt, and it is insufficient and unprofitable to memorise it. Students are also required to employ scientific thinking and need to be able to employ abstract thinking, in contrast to the intuitive thinking demanded in daily living (Maharshak & Pundak, 2004). For many students the heavy load of their studies reduces their ability to learn meaningfully (Runyan, 1991). For some students their independent learning time is cut back even further because they need to work to subsidise their studies. The result is that most students focus on obligatory tasks and exercises, and almost completely fail to devote time to reading that would help them to understand scientific theory and the underlying system of concepts. Their attention is directed to completion of regular assignments and they are left with little time for academic debate concerning the scientific culture for which they are being trained (Smith & Jacobs, 2003).

The way in which students understand the importance of textbooks is connected, *inter alia*, to the lecturers' approach. Many lecturers prefer an expansive approach that does not allow the reading requirements in a course to be reduced a single textbook, which contains the complete explanation of subjects to be presented during the course (Pundak & Rozner, 2007). Other lecturers apply an approach that concentrates on a single textbook and directs students to reading chapters before each lesson while they integrate selected issues from the chosen textbook within their lectures, although additional textbooks appear in the syllabus (Maharshak & Pundak, 2005; Henderson, 2008).

Research indicates that the lecturer's set of expectations regarding learning in academia contradict those of the students (Redish, Saul & Steinberg, 1998). This contradiction also exists with regard to the use of text books (Redish, 2003). While many lecturers expect that students will read chapters from the textbooks on their own initiative in order to deepen their understanding of the lecture subjects, the students only turn to textbooks when they need to cope with a task, which could not be answered after studying the notes that they wrote down in the lecture or in the lecturer's presentations (Smith & Jacobs, 2003). Research has found that students who received specific reading instructions regarding learning material that would be discussed in the next lecture, and were also tested on the learning material before the lecture, tended to study the textbooks more than students whose lecturer simply noted the textbooks at the beginning of the course (Cummings, French & Cooney, 2002). An additional aspect of the different expectations of lecturers and students relates to the language in which textbooks are written. The development of computerised learning has led to increased use of electronic on-line books, including all the features of a printed book (Bates, 2005). Students' perceptions regarding the use of electronic books were examined by Noorhidawati and Gibb (2008). Their findings indicated that there are three ways in which electronic books are studied: searching for data and facts, finding relevant contents and broad reading of the learning material. Most students did not refer to electronic books for broad reading of the learning material but mainly used them to search for specific relevant information.

2.2 The influence of globalisation on the local mother-language-dependent culture

In the opinion of many lecturers, students who join the scientific community should converse in its language. The scientific community has created a language abundant with concepts, theories and assumptions on which the scientific dialogue revolves. In addition, the scientific community has chosen English as the language for international communication. Students should, therefore, be exposed to and recognise this language from the initial stages of their academic studies (Dada, Landsard, Cano & Salzano, 2006).

Because of the difficulty involved in learning a language which is not the student's mother tongue, a bilingual style of teaching is engendered in which there is a certain level of integration between the mother tongue and the second language. A study investigating teaching that combined a mother tongue with a foreign language (Abed & Dori, 2007) examined the perceptions of Arab chemistry teachers in Israel concerning bi-lingual teaching. The research findings indicate three levels of bilingual teaching: (a) a combination of learning materials written in Hebrew while the teaching was conducted solely in Arabic (students' mother tongue) (b) a combination of both languages in the teaching process (Hebrew and Arabic) (c) Writing scientific terms in Hebrew alongside the written term in Arabic. Each level had its advantages and disadvantages both from the viewpoint of the teacher and that of the student.

Today’s global village that provides information simultaneously between all points on earth encourages migration. Prose and poetry describe experiences of migrants who were

forced to migrate to foreign countries and renew their functioning using a new and different language instead of their mother tongue (Harklau, Losey & Meryl, 1999). To a certain extent, a similar experience affects the student who arrives at university having already functioned in society as an independent adult. This student is then required to converse in an unfamiliar scientific language, including many terms that are foreign to his thinking (Hobbs, Silla & Beltran, 2008). Students who have succeeded in functioning well in complex situations, prior to their academic studies, often doubt their mental ability to cope with the academic learning challenge. Textbooks present the student with a double challenge: firstly they are not written in the student's natural language, and secondly they present a world of alternative thinking that differs from that to which the student is accustomed.

2.3 Engineering Students in Colleges and Universities

During the academic year 2006/7, the student population in Israel included 66,000 college students and 63,000 university students (Central Bureau of Statistics, Annual Statistical Abstract). The university and college syllabi for the different engineering degrees are similar, and they are supervised by the Higher Education Council (Israel Council for Higher Education, 2005). On the other hand there are differences in the policies for student entry requirements between the universities and the colleges. University entrance requirements for many of the leaning programs in engineering are higher than those of the colleges. The entry conditions in the colleges are less severe in comparison to those of the universities, but in many cases the demand for achievements at the end of the college engineering courses is no lower than that of the universities (Pundak, Herscovitz, Shaham & Weizer-Biton, 2009). As a result of this policy the dropout rate from college studies is relatively high.

In interviews conducted with university lecturers, they voiced a demand that the students should reveal ability for independent learning. According to this viewpoint the lecturer focuses on guiding the student and presenting the course subject-matter. In contrast college lecturers also emphasised a tendency to process the learning materials so that they would be more accessible for the students, and expressed commitment to instructing the students beyond the lecture hours (Johnson, Johnson & Smith, 1991).

3. THE RESEARCH PROCEDURE

3.1 Research goals

The research focused on exposing attitudes of engineering students in Israel at the inception of their studies in higher education institutions towards textbook and on-site reading in general, and textbook reading in science courses in particular.

Specific questions were derived from these general goals:

1. What were the reading habits of engineering students before they began their academic studies?
2. To what extent do students tend to read textbooks in English as opposed to textbooks written in their mother language?
3. What is the extent of importance attributed by students to the textbook during their science course studies?
4. What is the extent of influence of on-line learning materials and electronic books on the students' learning process?

5. To what extent are there differences in the consideration of the four above-mentioned research questions between engineering students in colleges and their university peers?
6. To define the needs of engineering students with regard to the assimilation of new learning materials, in light of the institution's teaching methods.

3.2 Research tools

A special attitudes questionnaire was developed for the research by staff dealing with science teaching in the ORT Braude Academic College for Engineering. The questionnaire included two parts: the first part was composed of 21 multi-choice questions, where the students were asked to choose one attitude out of the five attitudes presented for each question. These grades formed the basis for later statistical analysis. The second part included five questions, three questions dealt with the students' personal details, and two open questions asked the students to express their attitudes regarding the importance of textbooks.

The questions in the questionnaire's first part related to six categories: (a) the students' reading habits before their studies (b) reading practices during their studies (c) preferred language for textbooks (d) reading methods and skills (e) importance of textbooks for success in the course (f) integration of on-line learning materials in their learning. Table 1 below presents the distribution of the responses to the first 21 questions in the questionnaire according to the chosen categories.

Table 1: Distribution of the first 21 questions in the questionnaire according to the chosen categories, specifying question numbers belonging to each category

Number	Category	Question Number in the Questionnaire
1	Students' reading habits before commencing academic studies	1,2
2	Students reading habits during academic studies	3,4,11,14,18
3	Preference regarding language in which to learn	16, 19
4	Reading methods and skills	5, 6, 12, 17, 19
5	Importance of textbooks for success in the course	7,8, 10, 13, 20
6	Integration of on-line learning materials in the students' learning	15, 21

3.3 The research population

The questionnaire was distributed to engineering students in the first year of their studies in two colleges in the North of Israel: the ORT Braude Academic College and the Kinneret Academic College, and in the Engineering Department of the Ben-Gurion University. The questionnaire was transmitted through an on-line system. In the colleges the questionnaire was transmitted through the English and Physics course sites. The students

were asked to answer the questionnaire during these courses. In the Ben-Gurion University the students were asked to answer the questionnaires in their free time.

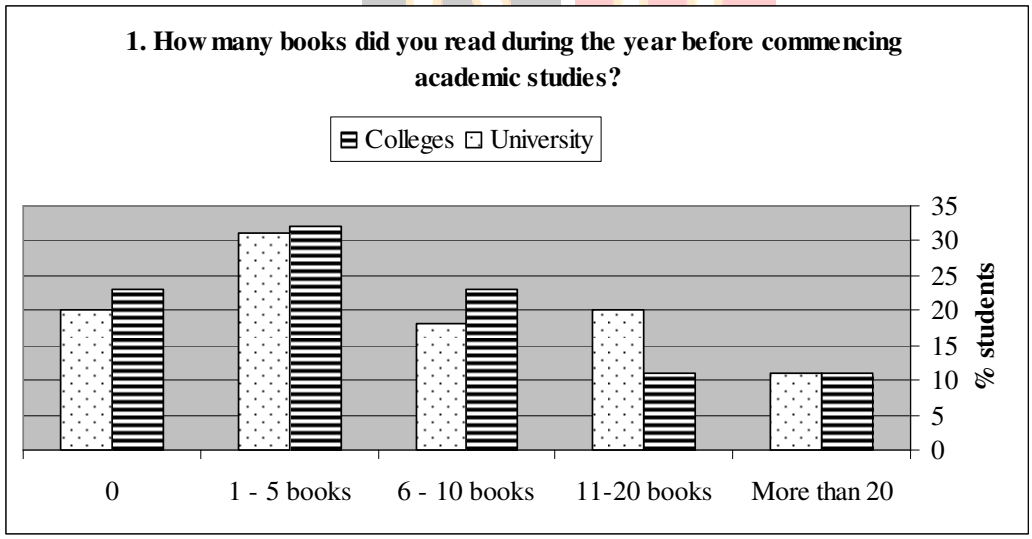
It should be noted that the percentage of responses to the questionnaires ranged between 20% at one of the colleges to 68% at the university. It can be assumed that this population is not necessarily a representative sample of engineering students, but that there may be a deviation due to the fact that this is the population that agreed to respond to the researchers' request to answer the research questionnaire. On the other hand, it is difficult to derive a clear correlation between the tendency to respond to the research questionnaire and the tendency to read. The results presented here suffer, therefore, from a certain deviation, whose influence was difficult to estimate.

4. RESEARCH FINDINGS AND DISCUSSION

4.1 Extent of students' reading habits before academic studies

Many studies have indicated that students' reading skills before beginning their studies have a strong impact on their ability to gain assistance from textbooks during their studies (Dada, Lansard, Cano & Salzano, 2006). Two research questions (1, 2) examined the students' attitudes concerning book reading before beginning their studies**.** The distribution of the students' answers to question 1 in the research questionnaire appears in Figure1.

Figure 1: Distribution of the students according to their reports regarding number of books read by them per year



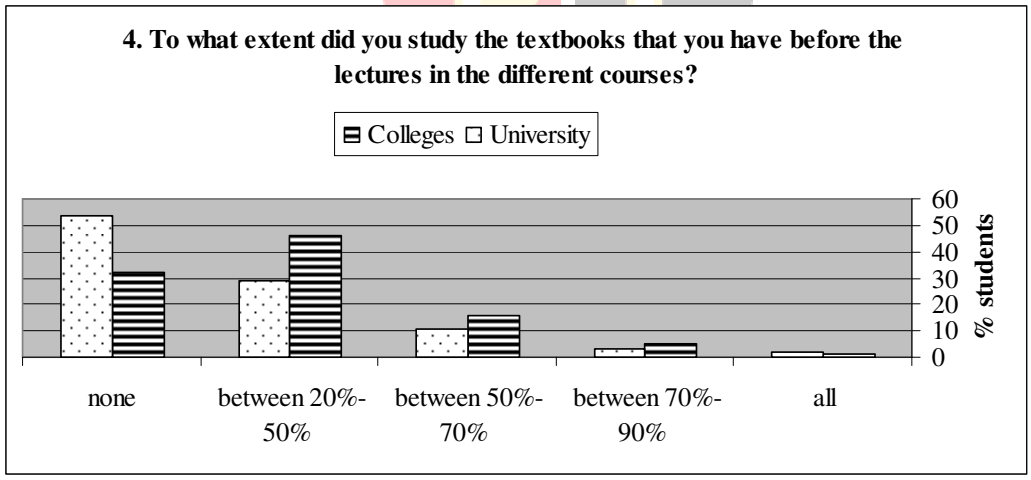
The results indicate a significant difference (t=1.66, P<0.001) between the mean extent of reading by university students (M=3.36) in comparison to the college students (M=3.32). The students in Ben-Gurion University had read slightly more on average than the college students. Nevertheless, similar trends can be noticed in the two student populations. Approximately 50% of the students who were questioned revealed a tendency to read very few books during the year or did not read books at all; while only 25% of the students read up to ten books per year and 11% read more than ten books per year. This finding is not surprising because of the strong tendency of students to prefer watching television, cellular

communication, on-line communication or playing video-games as opposed to reading (Prensky, 2006). These attitudes have a very high negative correlation (r=-0.841, P<0.001) with the second question that deals with the amount of time spent in book reading. As expected the time that is spent reading books becomes shorter as the number of books that the student reads increases.

4.2 Extent of reading during academic studies

According to the findings, the typical student studies few textbooks before the lectures. The distribution of the students' extent of textbook reading in preparation for lectures appears in Diagram 2. These results were obtained in answer to Question 4: To what extent do you study the textbooks that you possess before lectures in the different courses? The results indicate a significant difference in the average level of reading before the lectures between university students (M=1.54) and college students (M=1.56) and in the t-test (t=1.07, P<0.05). The university students read slightly less on average than the college students. 54% of the university students and 32% of the college students do not read textbooks at all before the lectures. The university students read slightly less, on average, in comparision to college students. 54% of the university students and 32% of the college students do not read textbooks at all before the lectures. If the students that read partially before the lecture are added to these, then 83% of university students and a similar percentage of college students (78%) do not read or read a little in preparation for lectures. In other words, most of the students do not exploit or only partially exploit the textbooks during the science courses. These findings are supported by USA findings regarding students' reading of physics textbooks (Cummings, French & Cooney, 2002).

Figure 2: Distribution of students' textbook reading before lectures



The finding - that text books do not serve as a very important learning means for most of the studied students - is reinforced by the answers to additional research questions. From the answers to Question 11 that deals with the time devoted by the students to reading text books during a week, it transpires that close to 90% of the students read textbooks for five or less hours during an academic week. In addition, 61% of college students and 67% of university students read textbooks for less than two hours per week. There is a significant correlation between the results for Question 4 that dealt with the percentage of courses for

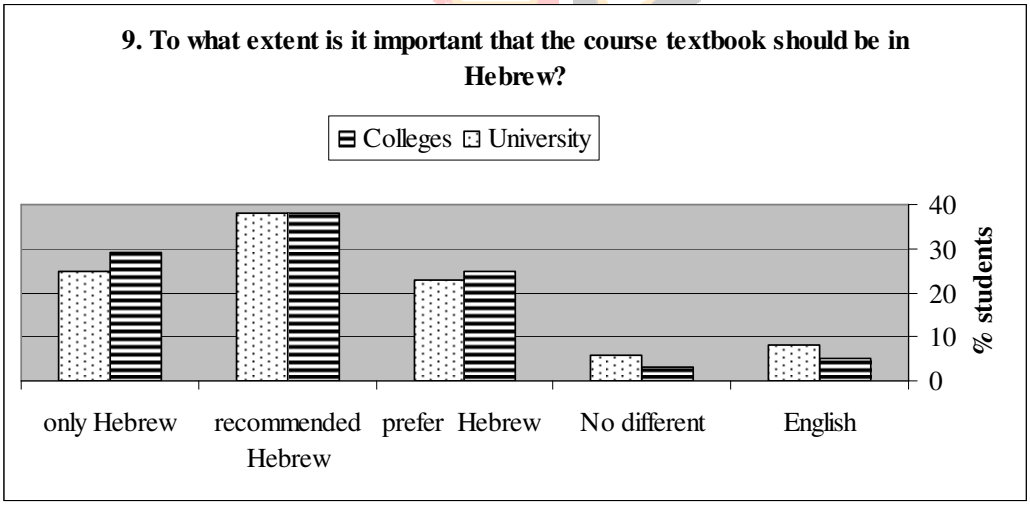
which the students read textbooks before the lectures and Question 11 that related to the weekly amount of time for reading. According to a Pearson correlation ($r=0.701$, $P<0.001$) a significant correlation was also found between Question 11 and Question 3 that dealt with the number of textbooks studied by students during a semester ($r=0.796$, $P<0.001$). For all the questions that examined the extent of influence on the engineering students' learning process in higher education institutions it was found that most of the students derive only partial benefit from textbooks.

4.3 Textbook language

No significant difference was found between the tendencies of university students and those of college students regarding the language in which the textbooks were written. The studied students attribute much importance to the fact that a textbook is written in their mother tongue, Hebrew.

In their answers to Question 9, 92% of them clearly expressed this preference, as is shown in Diagram 3. Some of them (29%, 25%) [Author's note: consecutive percentages in brackets indicate results for university students, followed by results for college students] felt that textbooks in English posed a difficulty that they could not overcome. Others (38%) noted that they preferred a textbook in Hebrew. These results are in line with their preference for purchasing textbooks in Hebrew when they need to choose a textbook to buy for an academic course (Question 16). It was found that (65%, 72%) of students in universities and colleges correspondingly preferred to purchase Hebrew books. In contrast (27%, 21%) held a middling attitude according to which there was no difference whether the book was written in English or Hebrew and only 8% expressed a preference for a book in English. A high correlation was found between the students' answers to Questions 9 and 16 ($r=0.616$, $p<0.001$).

Figure 3: Distribution of students' preferences for textbook language in basic sciences and engineering courses

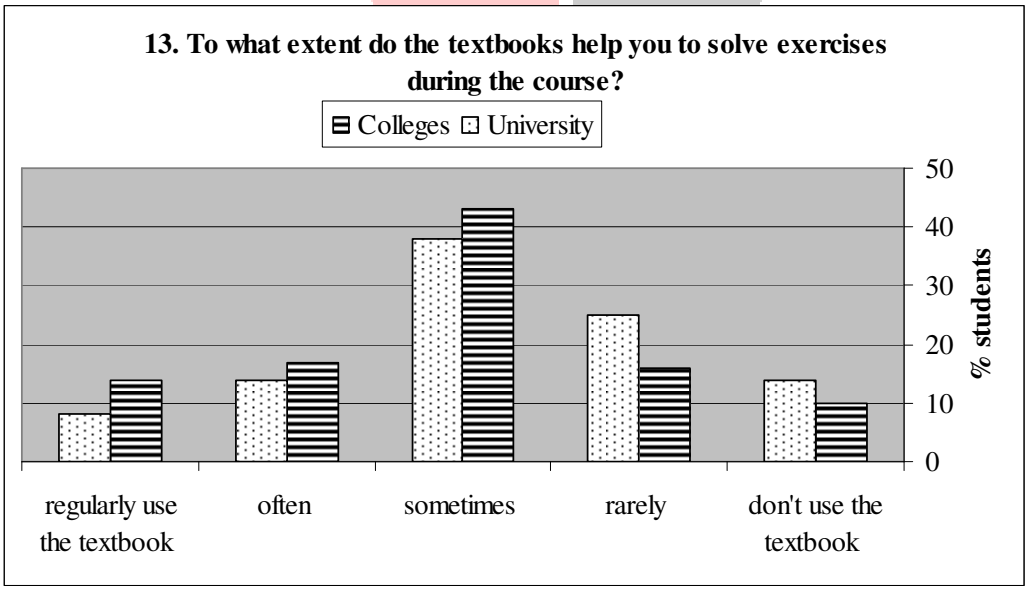


According to the research findings most of the students, both from the university and from the colleges preferred to read textbooks in their mother tongue, in the present case: Hebrew.

4.4 Reading methods and skills

Before beginning their academic studies, the students principally read 'storybooks with a plot', that included descriptions from the subjective viewpoint of the hero or the narrator. There are substantial differences between such tales and a textbook. In storybooks, the reading experience is created through a sequence of events and description of situations. There is a covert assumption that the reading will be continuous and usually continue for several days, during which the reader will succeed in remembering the main points of the story. In contrast, the textbook is addressed to the learner, who has a long process of learning ahead in a course that may continue for three or four months. During the learning process the textbook cannot be read continuously but needs to be referred to in portions, according to the lecturer's instructions, in reference to matters discussed in class, tasks that are given and during the period of revision for examinations and tests. In relation to Question 13 most of the students (58%, 79%) chose the statement that there is no similarity between reading a textbook and reading a storybook; while (13%, 20%) claimed that there is only a slight resemblance between the two types of book. The recognition of these differences is important in order to develop different reading skills in a transition between story books and textbooks.

Figure 4: Distribution of importance attributed by students to assistance from a textbook during exercise solution



There is an assumption that a textbook is intended to help the learners to construct a new system of concepts and ideas that accompany them in their future as scientists or engineers, as part of the 'toolkit' with which the academic world equips them. Of the different components of textbooks, students prefer the component of solved exercises (57%) followed

by explanations and theory (35%), while the corresponding importance of the other components (formulas/OR equations, titles and illustrations) is marginal.

Figure 4 displays the distribution of students' attitudes regarding the importance of the textbook when solving exercises. There is a slight difference between the average attitude of students in colleges (M=2.79) and the average attitude of students in the university (M=2.63), regarding the importance of textbooks in solving exercises. According to a t-test, this difference was found to be significant ($t=0.506$, $P<0.05$), meaning that that even the most important assistance to students from textbooks for the solution of exercises is perceived by students as merely partial assistance. These findings are compatible with the findings of Bruning (2008) that most students at the beginning of their studies lack the necessary skills for organisation and understanding of concepts and ideas that emerge from reading a textbook.

4.5 The importance of textbooks for success in the course

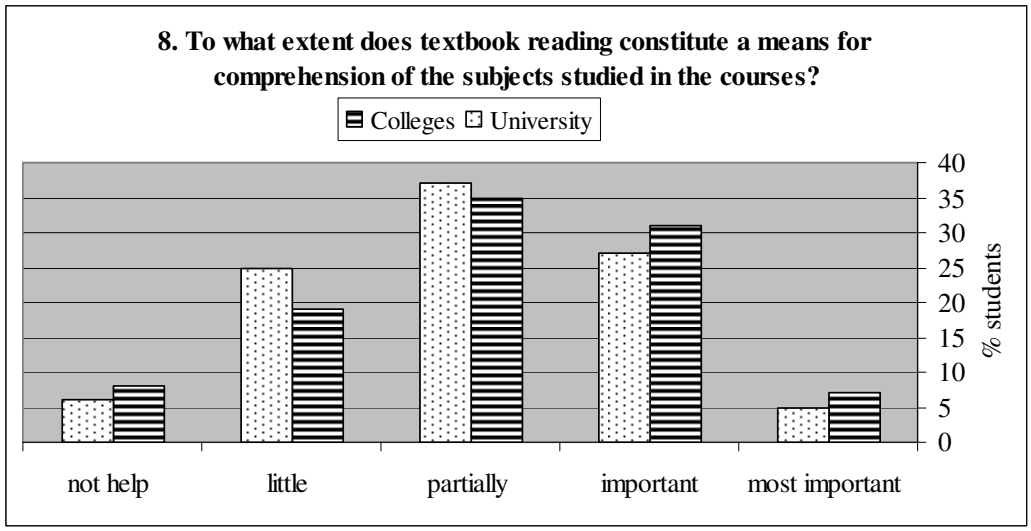
Despite the fact that most students devote little time to reading textbooks and seem to have only basic skills in textbook reading, most of them attribute importance to textbooks for their success in the course. Diagram 5 presents the distribution of students' attitudes on this subject.

Out of the students who were questioned (38%, 32%) estimated that textbooks made a very important or important impact on their understanding of subjects, while (35%, 37%) indicate only a partial impact. T-tests found no significant difference between the college students' attitudes and those of the university students for this question. A significant correlation was found between the recognition of the importance of textbooks and the students' replies to three questions:

a. The number of textbooks that the students study ($r=0.628$, $p<0.01$) in Question 3.
b. The percentage of lectures before which the students study the text books ($r=0.453$, $p<0.01$) in Question 4
c. The number of hours devoted to reading the textbooks during a week of studies ($r=0.668$, $p<0.01$) in Question 11.

In other words the textbook is seen as more important for success in their studies by those students who spend more time studying them. As was seen in the previous section, the textbook is still used primarily for exercise solution.

Figure 5: Assessment of the contribution of textbooks to understanding of subject-matter studied in science courses



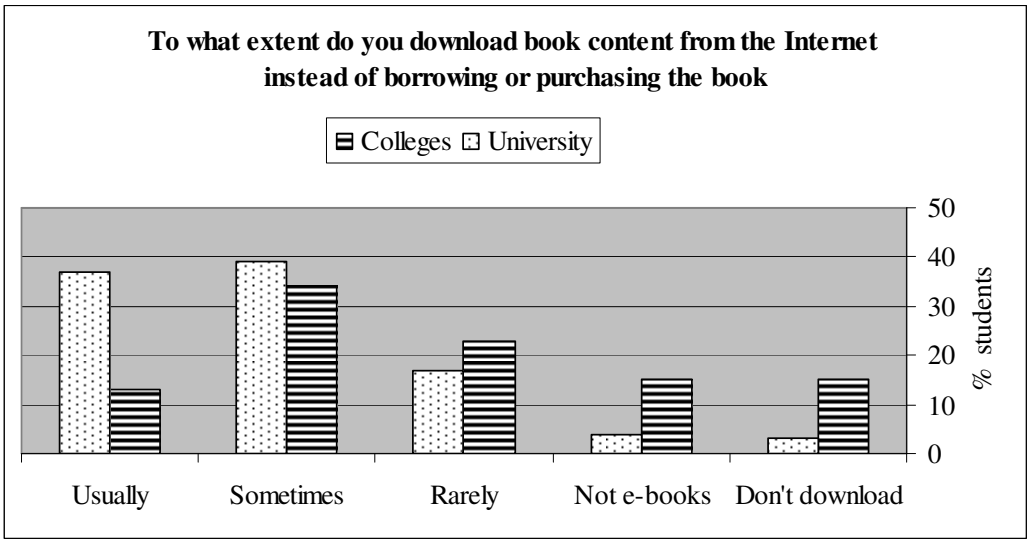
Despite the declared importance of the textbooks, a large proportion of all the students (40%) claim that reading instructions are only provided in the syllabus and only the name of the textbook appears there. An additional 42% claim that reading instructions are very general. Only 18% think that clear reading instructions are given during the course. This finding suggests a direction for solution, to improve the extent of textbook reading. Clear reading instructions are needed, and should be provided to the students by the course lecturer on a weekly basis.

4.6 Integration of on-line learning materials

Today, almost all learning materials and textbooks are available on-line, as well. Many contents can be downloaded from the Internet to help the students during the learning process. Question 15 examined the students' attitudes regarding the extent to which on-line materials helped them with the learning process. The results appear in Diagram 6 below.

There is a significant difference in the answers to this question ($t=6.70$, $p<0.001$) between the college students ($M=2.55$) and the Ben Gurion university students ($M=4.25$). Only 13% of the college students indicated that they were regularly helped by on-line materials and e-books, however in the universities the number of regular Internet users reached 37%. The results indicate a significant difference in the importance ascribed by students to the learning resources that exist on the net. While college students attribute little importance to on-line materials, despite their easy accessibility and low cost, university students attribute much importance to these materials.

Figure 6: Extent of the students' use of on-line learning materials



In order to examine whether this difference was related to the use of English language online resources, Question 23 examined the way in which students assessed their ability to read textbooks in English. A significant difference was found (t=0.883, p=0.001) between the average for college students' responses (M=3.80) and that of university students (M=4.20). However, the correlation between students' attitudes regarding knowledge of English and their attitudes concerning their use of learning materials on the net was found to be insignificant.

5. SUMMARY: A MARKETING APPROACH

The research focused on the market segment of engineering students, at the inception of their academic studies in the State of Israel. This is a clear and defined target market that copes with academic tasks by using textbooks, written in English, which is not the students' mother tongue. The research revealed the difficulties, needs, desires, preferences and attitudes of this market segment. The authors assume that engineering students' needs, in the State of Israel, are not substantially different from the needs of other engineering students beginning their academic studies in other world states, whose native language is not English. Similar studies are needed in these states and the authors intend to initiate a comparative study in other states to verify this assumption.

It is not simple to provide the necessary response to the market segment on which this research focused. The discovery of the fact that at the beginning of their studies few of the engineering students are assisted by textbooks in their own language, and consequently even less so by textbooks in English, is to a certain extent, an open secret. The authors estimate that response can be designed for this need through a synthesis of different strategies.

A student who begins academic studies, in general - and particularly an engineering student - is required to undergo changes in the transition to the academic world. Among other things, the student is required to read textbooks in a systematic way, sine they constitute the theoretical basis for basic science courses (Hoyle, 2005). This study found a correlation between the students' reading habits in general and their tendency to read textbooks during their studies. On the other hand, the research indicates a phenomenon of students who are

rarely assisted by textbooks. Moreover, a gap was found between university students who are greatly assisted by on-line sources, while only a small percentage of college students see on-line sources as a replacement for textbooks. Most of the sites on the net are written in English so that reading them constitutes a difficulty for most of the studied students. It seems that the university students were less deterred from learning that relied on a foreign language than their colleagues from the colleges, since it was found that they were helped more frequently by the online sources.

This study does not leave any doubt regarding the preferred language for studies for the students, without any distinction between university and college students. More than 90% of the questioned students preferred to read books and learning matter in Hebrew. Most of the students claimed that they have a command of English in three areas: speech, reading and writing. Their attitudes with regard to their mastery of the English language are influenced by their reasonable to high functioning in spoken English. However, reading a chapter in an English textbook requires different more complex coping skills and the lecturers' assumption that students' are helped by English textbooks is not realistic for many students.

6. RECOMMENDATIONS

Although the majority of the studied students do not read very much, most of them saw the textbook as a significant component of the academic learning environment. In the researchers' assessment, in order to improve this situation a combination of solutions should be used that would include the following components:

1. A lessening of the study load that a learning program creates so that the student would have reasonable time available for reading.
2. Guidance for the student by the lecturer to essential defined reading excerpts in order to enhance the student's level of thinking and comprehension.
3. Creation of the right combination of English and Hebrew textbooks, so that the student will know the essential components and concepts in a course presented in the student's mother language.
4. Inclusion of an assessment component based on examination of textbook reading through short tests in the grade for the course.
5. Investing efforts to translate into Hebrew and edit the books and sites that accompany each basic engineering and science course.
6. Development of an Internet site to accompany the textbooks and present parts of it on the net. This site would help the students to access the subjects they wish to learn, enabling quick reference to concepts that are difficult to understand, presenting links between concepts and theories.

An integrated effort according to the six lines of action indicated here could enable systematic learning, in order to improve understanding of the concepts and theories at a high academic level, and enhance the self-learning component with increased use of textbooks and on-line learning sources.

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Appendix A: Research on the Subject of Textbook Reading of Sciences and Engineering Students

1. How many books did you read during the year before commencing academic studies?
   a. More than 20 books
   b. 11-20 books
   c. 6-10 books
   d. 1-5 books
   e. I do not read books
2. What amount of time do you usually devote to reading a book?
   a. 2-3 days
   b. About a week
   c. Two weeks
   d. A month
   e. Irrelevant, I don't read books.
3. How many textbooks have you looked at this semester?
   a. More than 6
   b. 4-5
   c. 2-3
   d. One
   e. I am not helped by textbooks for my studies.
4. To what extent do you study the textbooks that you have before the lectures in the different courses?
   a. I study textbooks that I have before the lectures in all the courses that I study
   b. I study textbooks that I have before between 70%-90% of the lectures
   c. I study textbooks that I have before between 50%-70% of the lectures
   d. I study textbooks that I have before between 20%-50% of the lectures
   e. I do not study textbooks before the lectures
5. What extent of importance do you attribute during the reading of textbooks to the illustrations that appear in the textbook?
   a. The illustration in the book are usually unimportant
   b. The illustrations in the book have little important for comprehension of the studied subjects
   c. The illustrations in the book have only partial importance for comprehension of the studied subjects
   d. The illustrations in the book are very important for comprehension of the studied subjects
   e. The illustrations in the book have supreme importance for the comprehension of the studied subjects, often more than the written text.
6. What extent of importance do you attribute during textbook reading to the formulas and mathematical expressions that appear in the book?
   a. The formulas and mathematical expressions are usually unimportant
   b. The formulas and mathematical expressions usually have only slight importance
   c. The formulas and mathematical expressions have only partial importance for the comprehension of the studied subjects
   d. The formulas and mathematical expressions are very important for the comprehension of the studied subjects
   e. The formulas and mathematical expressions have supreme importance for the comprehension of the studied subjects, often even more than the written text.

7. To what extent is it clear to you which chapter(s) you are supposed to read before the lecture?
   a. The lecturer presents the chapters required for reading before each lecture
   b. There are clear instructions for the chapters I have to read on the course site
   c. There are general instructions regarding the chapters I have to read on the course site
   d. There are instructions in the syllabus regarding the chapters I have to read according to a timetable
   e. The syllabus shows the textbooks I have to read
8. To what extent does textbook reading contribute as a means for comprehension of the learning subjects in the courses?
   a. The course book is the most important means (more than lectures, exercises, the course site etc.)
   b. The course book is an important means alongside other learning environments
   c. The course book is a learning means that is partially helpful for my studies
   d. The course book helps very little in my studies
   e. The course book does not help me in my studies
9. To what extent is it important that the course textbook should be in Hebrew?
   a. It is unimportant; English is the professional language that I have to read to understand the studied subjects.
   b. It is only slight important
   c. Its comfortable for me to read textbooks in Hebrew but I can manage with an English textbook
   d. A textbook in Hebrew helps me to learn more meaningfully than a textbook in English
10. To what extent do examples of problem-solution that appear in the text books help you to understand the course subjects?
    a. The problem-solution examples in the textbook are very important for comprehension of the course
    b. The problem-solution examples in the textbook are important for comprehension of the course
    c. The problem-solution examples in the textbook have little importance for comprehension of the course
    d. The problem-solution examples in the textbook have no importance for comprehension of the course
    e. I don't look at the problem-solutions examples in the textbook
11. What amount of time do you usually devote to textbook reading during the week?
    a. More than 10 hours
    b. 6-9 hours
    c. 3-5 hours
    d. 1-1.5 hours
    e. I don't study textbooks
12. To what extent do you relate to points that you did not understand during your textbook reading
    a. Although the textbook is intended to clarify things, I don't tend to relate to points I don't understood
    b. I rarely notice points that I don't understand in the book and I don't relate to them
    c. I rarely notice points that I don't understand in the book and I take a note of them
    d. I sometimes notice points that I don't understand in the book and relate to them
    e. I often notice points that I don't understand in the book and tend to relate to them.

13. To what extent do the textbooks help you to solve exercises during the course?
    a. I don't use the textbook to help me solve exercises
    b. I rarely use the textbook to help me solve exercises
    c. I sometimes use the textbook to help me solve exercises.
    d. I often use the textbook to help me solve exercises
    e. I regularly use the textbook to help me solve exercises
14. Do you read books and articles in areas connected with the course in addition to the designated textbooks that appear in the syllabus
    a. No, I don't read beyond the compulsory requirements
    b. I rarely broaden my reading beyond the compulsory course reading
    c. I sometimes broaden my reading beyond the compulsory course reading
    d. I often broaden my reading beyond the compulsory course reading
    e. I always broaden my reading beyond the compulsory course reading
15. To what extent do you download book content from the Internet instead of borrowing or purchasing the book?
    a. I don't download materials from the Internet
    b. I am not helped by e-books, which have been downloaded from the Internet.
    c. I rarely download or receive textbooks from the Internet
    d. I sometimes download or receive textbooks from the Internet
    e. Usually the textbooks that I study have been downloaded from the Internet
16. In the course bibliography list there is a textbook in English and a textbook in Hebrew. If you only intend to purchase one book, which of them will you choose?
    a. The English textbook
    b. The decision depends on the price of the book, if the English book is less expensive I will buy it
    c. I cannot decide beforehand I have to see the books before I buy them
    d. In most cases I prefer to buy a textbook in Hebrew
    e. The Hebrew textbook
17. To what extent are you helped by titles of chapters, section and sub-sections that appear in a book in order to choose and focus on the subjects that you read?
    a. Titles of chapters and sections are very important when I choose and focus on my reading of different subjects
    b. Titles of chapters and sections are important when I choose and focus on my reading of different subjects
    c. Titles of chapters and sections are important to a certain extent when I choose and focus on my reading of different subjects
    d. Titles of chapters and sections have little importance when I choose and focus on my reading of different subjects
    e. Titles of chapters and sections are unimportant when I choose and focus on my reading of different subjects
18. To what extent is textbook reading similar to storybook reading
    a. The way in which a textbook is read is very similar to the reading of a storybook
    b. The way in which a textbook is read is somewhat similar to the reading of a storybook
    c. The way in which a textbook is read is only slightly similar to the reading of a storybook
    d. The way in which a textbook is read is not at all similar to the reading of a storybook
    e. I don't read books
19. To what extent can a textbook be read from the middle without reading the previous chapters?

a. It is impossible, in order to understand the discussed issues I have to begin from the beginning and read the chapters according to their order
b. It is very rarely possible, only when each chapter is written as almost independent without relying on the previous chapters
c. It is sometimes possible, only when each chapter is written systematically
d. It is often possible, when I understand the learning subject-matter and the chapter helps me with certain issues that I want to study more deeply
e. To begin with reading from the beginning of the book is a recommended method that helps me to examine the extent of my understanding

20. Is there a connection between the models presented in the textbook in science courses and your daily experience?
    a. No. Science books present scientific models, which are unsuitable for daily reality
    b. It is rare that a scientific example found in textbooks is appropriate for daily life
    c. Textbooks include a reasonable number of examples that testify that scientific laws exist in reality
    d. In fact most of the theories and laws in textbooks rely on reality that describes my daily life
    e. Science books are the reality, they are founded on it and everything written in them belongs to daily reality
21. To what extent are there Internet sites that support the use of textbooks in the science courses and enrich the learning material, such as: additional questions, solutions to questions, simulations, demonstrations etc?
    a. Each science textbook that I am familiar with has an accompanying site with enriching materials
    b. Only a small proportion of science textbooks have an accompanying site
    c. Most of science textbooks do not have an accompanying site
    d. I don't know of even one site that accompanies a science textbook
22. How many years passed since you completed your secondary school and until you began your academic studies?
    a. Less than a year
    b. 1-2 years
    c. 3-5 years
    d. 5-10 years
    e. More than 10 years
23. What is the level of your reading ability in English
    a. Limited to a few words
    b. Limited to a few sentences
    c. Reasonable – I succeed in reading several sections continuously (30-50 sentences)
    d. Good – I succeed in reading and understand several pages in English
    e. Very good – I succeed in reading books in English
24. Please indicate your sex
    a. Male
    b. Female
25. Are there textbooks in the courses you study that you prefer? If there are detail the names of the books and indicate to which course they belong.
26. If you have any remarks to make concerning the issues dealt with in the questionnaire we would be grateful if you would note them here.