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Mathematical Problem Solving Strategies in Plain English

Dina A. Al-Jamal[1*] Ruba M. Miqdadi[2]
1. Faculty of Education, Yarmouk University, Jordan
2. Faculty of Education, Yarmouk University, Jordan
*E-mail of the corresponding author: deena.j@yu.edu.jo; din_aljamal@hotmail.com

Abstract
The mathematics word problem solving in EFL setting of Jordanian undergraduates were investigated through Polya's (1957) adopted test as accompanied by self-report open questions procedures. In this study, mathematical problems content is used to assess their language and learning strategies. The results indicated that participating undergraduates were identified either as low problem solvers as well as limited English language proficiency students.
Key words: *problem solving strategies, EFL, math, Jordanian undergraduates.*

1. Introduction

English is eminent as an international language in science, technology, and politics everywhere in the world, reading in English is a pre-requisite to almost all graduate programs. Jordanian students learning English as a foreign language face many challenges. Not only must they learn a new system of communication and become comfortable with a new culture, but they must also use the new language to learn the academic subjects at the university setting. Recently, learning theory guides educators to embrace interrelated learning settings which encourage learners to use higher order thinking skills, and in particular, problem solving skills. Splitting content from application has adversely affected the educational systems (Hiebert, Carpenter, Fennema, Fuson, Human, Murray, et al, 1996; Pavlin-Bernardic et al 2008; Vilenius-Tuohimaaa, Aunolab & Nurmib, 2008). Students frequently acquire details and rote procedures with few connections to the context and application of knowledge. Problem solving has become the tactic to rejoin content and application in a learning situation for basic skills as well as their application in various contexts.

As educationalists (Jacobs, Heibert, Given, Hollingsworth, Garnier, & Wearne, 2006; Mayer & Hegarty, 996; Thorndike, 1917) call for further integrated instruction, problem solving repeatedly assists as an element that links together several disciplines, strategies, and skills. As early as 1917, Thorndike claimed that understanding a paragraph is like solving a problem in mathematics which requires selecting the right elements and putting them right amount of weight for each. In reading, too, the mind must select, repress, emphasize, create, and organize all pieces of information. In the present study, problem solving is perceived as an essential core in the comprehension processes of mathematical word problems that are written in English language. The rhetoric of this study questioned the idea of identifying strategies of problem solving in mathematical problems while the language of such problems is a challenge (English as a foreign language) in itself? (Kintsch, & Greeno, 1985) So, the focus on problem solving emphasizes basic literacy skills in English (i.e. reading and writing)? Literacy skills in learning content areas are relevant to suggestions for constructing, selecting, and teaching mathematical word problems. For language ability and mathematics ability seem to be linked, such that lower language proficiency tends to translate into poorer mathematics performance (MacGregor & Price, 1999).

Mathematical literacy is very complex, and involves coordination of many different reading and literacy skills and attributes, comprising phonemic awareness, vocabulary, text comprehension, and spelling. In reading math mathematical problems in English as a foreign language, many strategies and processes are used in order to respond to the literacy needs of undergraduate students. Collier (1989) maintained that students may develop English for social communication in about two years, yet they need from five to seven years or more to adequately develop the language skills needed in academic subject areas.

Furthermore, language skills and mathematics problem solving need a strategic approach to understanding and representing the problem, and functioning and operating a plan for its resolution. The strategic approach mostly recommended in the current study for mathematics problem solving is based on Polya's model, which involves understanding the problem, devising a plan, carrying out the plan, and looking back (Polya, 1957). Silver & Marshall (1990) maintained that teaching students appropriate strategies for working through each of these steps of the problem solving process has improved performance at all grade levels, including college students. Thus, effective problem solvers appear to use specific problem solving steps that lead to success in mathematics. Problem solving stages of the Polya model in sequence is a highly effective approach to solving word problems.

Learning strategies are the purposeful actions and thoughts learners engage in for understanding, storing, and remembering new information and skills (McKenna & Robinson, 2006; Weinstein & Mayer, 1986). The aim of these strategies is to help all pre-service undergraduate students to have their own unique structures that are different from those of other texts (i.e. expository, narrative, or descriptive). Most students, regardless of their reading English language ability, struggle at times with mathematical problem texts (Barton, Heidema & Jordan, 2002; Wood & Taylor, 2006). There are many reasons why mathematical text contains vocabulary that is both challenging and novel. The following review of research, however, focuses on issues related to the comprehension gains as a result of strategy employment on the one hand; and exploiting the English and math comprehension literacy dilemma, on the other hand.

1.1Strategy gains

A comprehension strategy is a plan or technique used by readers to obtain information they want from the text. Harris and Hodges (1995) defined a reading comprehension strategy as “a systematic sequence of steps for understanding text” (p. 39). Reading strategies have long been recognized for use in content area settings (McKenna & Robinson, 2006). Reading strategies are well-defined as explicit instructional methods for teaching reading sub-skills such as vocabulary and before-, during-, and after-reading procedures (Wood & Taylor, 2006). Reading strategies improve comprehension, and consequently, a better understanding of topic detailed information. Nevertheless, unlike the reading compressed at content subjects of English, social studies, and science, reading strategies have hardly been planned specifically for mathematics (Barton, Heidema & Jordan, 2002).

Under the impact of cognitive learning theories, problem solving moved to mean a complex mental activity involving a range of cognitive skills and actions. Problem solving includes higher order thinking skills for instance "visualization, association, abstraction, comprehension, manipulation, reasoning, analysis, synthesis, generalization—each needing to be 'managed' and 'coordinated'" (Garofalo, & Lester, 1985, p. 169). One of the pioneers in identifying a general problem solving model to explain problem solving processes was Polya(1957). Polya’s assumption was made that by learning explicitly suggested steps (understanding the problem, devising a plan, carrying out the plan, and looking back) of mathematical word problem.

However, Krulik & Rudnick (1987, p. 4) defined problem solving as: “The means by which an individual uses previously acquired knowledge, skills, and understanding to satisfy the demands of an unfamiliar situation. The student must synthesize what he or she has learned, and applies it to a new and different situation”. Krulik and Rudnick claimed that educationalists must teach a method of thought that does not pertain to specific or pre-solved problems or to any specific content or knowledge. A heuristic is this kind of method. It is a process or a set of guidelines that a person applies to various situations.

Literacy is multifaceted and involves the orchestration of many different skills or abilities, including phonological awareness, phonemic awareness, phonics, oral language development, oral reading fluency, reading comprehension, spelling, writing, and especially vocabulary (Shanahan & Beck 2006). Thus English language competence affects students’ text comprehension and together with their ability to learn new concepts.

In this research, a mathematical comprehension strategy is a technique used by undergraduate pre-service students to get information they need from the text, for the purpose of choosing the correct stem on a multiple-choice test. The goal is to identify students’ strategies that are effective, as well as, to be aware of tackling mathematical problems texts that are expressed in English with success.

Employing problem solving strategies has had a positive effect on student achievement in various disciplines among which are English and mathematics. In mathematics, principles of cognitive instruction are embodied in the Jordanian curriculum criterions as developed by the Ministry of Education (Ministry of Education, 2008). These criterions state that chief objectives for mathematics teaching are problem solving, reasoning, and communicating mathematically. Through learning mathematics, students should be able to solve problems faced in the actual world and to reason and talk about their ways out. In this research, English as a foreign language plays a much larger role than has been the case in students’ first language (i.e. Arabic). Jacobs et al (2006) pointed out that problem solving is more than just altering written language to mathematical signs. To some extent, problem solving is reliant on reading the problem for understanding. Then the reader needs to convert the words to the precise mathematical statements, make links among the words and the math, and lastly recommends an answer that is thorough for the problem.

1.2 English and math

Learners solve mathematical word problems vary according to their assumptions about the growth of their abilities which improve their attainment in mathematics. According to mathematical- logical models, solving word problems mainly necessitates conceptual knowledge. In this respect, Kintsch & Greeno (1985) maintained that linguistic models emphasize the significance of understanding and interpreting the text of the word problem. To them, solving a mathematical word problem begins with text comprehension. On the basis of the textual form of the problem, a text representation is created, which is the foundation for solving the problem mathematically. The text base contains the basic data from the text of the problem, and the model of the problem contains the related data from the text in a form appropriate for carrying out the arithmetic action. The learner creates the model of the problem by deducing and concluding which data is required in solving the problem and is not encompassed in the text base, while excluding the data which is unnecessary, nevertheless is part of the text base.

The kind of relationship between English and math was illustrated by Vilenius-Tuohimaaa, Aunola & Nurmib (2008) who examined the connection between mathematical word problem skills and reading comprehension. The participants were 225 children aged 9-10 (Grade 4). The children's text comprehension and mathematical word problem-solving performance were tested. The results showed that performance on math word problems was strongly related to their great performance in reading comprehension.

The ability to comprehend reading has an effect on mathematical problem solving ability was stressed by Zende (1983). In his study, Zende conducted a standardized test of reading comprehension and knowledge of mathematical concepts and application at the beginning of a school year for two seventh grade classes. They were then taught precisely the same way for 14 weeks, with the exclusion that the experimental class was given a special group lesson once a week that was designed to assist them in learning to solve problems through word meanings, problem solving strategies, and symbol meanings. The experimental class was also given vocabulary and symbol usage practice. At the end of 14 weeks, the classes were retested on the same measure. The results indicated that the experimental class students improved their scores on the reading comprehension test and on the knowledge of mathematical concepts test, but that the control class students achieved greater gains without the extra instruction.

Many approaches were introduced to enhance mathematical performance in ESL setting. For example, Chamot, Dale & Spanos (1992) examined performance assessment attended by think-aloud procedures mathematical problem solving approaches of ESL students. Students were enrolled in ESL mathematics classes in a Title VII project applying the Cognitive Academic Learning Approach (CALLA). In this approach, curriculum content is used to improve academic language and learning strategies are taught explicitly to increase students' metacognitive awareness and to facilitate their learning of both content and language. The findings displayed that significantly more students in high implementation classrooms were able to solve the problem correctly than were students in low implementation classrooms. The results showed that explicit teaching in a problem solving successive procedure is useful for ESL students. Impediments acknowledged in the study were that even in high implementation classrooms, lower achieving students did not use the correct sequence of problem solving steps. Reasons could be credited to differences in mathematics ability, differences in linguistic competence (since the task involved reading and understand a word problem), and/or amount of prior knowledge about learning and problem solving strategies.

Quite a few researchers underlined mathematical content area reading challenge for students in ways not apparent in other subjects. For instance, Mayer & Hegarty (996) and earlier Schoenfeld (1992) emphasized that if students do not recognize the words they are reading and cannot develop meaning from context, they must enlarge their vocabularies and learn a repertoire of comprehension strategies thus, understanding the text is dependent upon a student's understanding of the associated mathematical concepts. Consequently, learners reading math texts written in English attempt to browse visually from right to left when reading descriptive text, but also up and down, and left to right to read the math problems inserted in or offered with the text. And once problems are read, word problems present mostly grave reading problems. As the problems are not only challenging mathematically, yet further, students encounter difficulty with vocabulary or go through particular reading miscues. In this regard, Jacobs et al (2006) displayed that problem solving is more than just changing written language to mathematical symbols. Equally, problem solving is reliant on reading the problem for understanding. Then the reader must alter the words to the precise mathematical statements, make connections between the words and the math, and finally suggests a solution that is practical for the problem.

The significance of language in student test performance on mathematical word problems was stressed by Abedi & Lord (2001). Abedi & Lord maintained that English foreign language students score lesser than native speakers in standardized tests of mathematical achievement. In their study, students were given unconfined items from the National Assessment of Educational Progress mathematics assessment, along with equivalent items that were revised to lessen their linguistic difficulty. In interviews, students usually preferred the revised items over the original matching parts. Paper-and-pencil tests containing original and revised items were conducted to 1,174 eighth grade students. Students who were English language learners (ELLs) scored lower on the math test than proficient speakers of English. Linguistic modification of test items brought about significant differences in math performance; scores on the linguistically revised version were faintly greater. Some student groups profited more from the linguistic modification of items—particularly, students in low-level and average math classes, but also ELLs and low SES students.

To increase student's competence to address diverse problems in a changing environment, Bernardo (2001) suggested transferring knowledge and skills for one problem in one setting to analogical problems in new settings. Bernardo described the results of three experiments studying the use of a specific learning task for stimulating analogical transfer with word problems in basic probability among high school students. This strategy involved letting students construct their own analogous problems. It was expected that such a process would allow students to more dynamically discover the behind problem structure. The results of three

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experiments displayed that, matched to a control group, students who used the analogical problem construction strategy were better at: (1) transferring analogical problem information between analogous source and target problems; (2) retrieving the analogous source problem; and (3) applying the retrieved analogous information to the target problem.

In sum, research has drawn attention to the significance of language in student performance on assessments in content-based areas such as mathematics. Learners perform worse on arithmetic word problems than on comparable problems presented in numeric format. The difference between performance on verbal and numeric format problems intensely proposes that issues other than mathematical skill add to success in solving word problems. Researchers (Abedi & Lord, 2001; Bernardo, 2001; Chamot, Dale & Spanos, 1992; Jacobs et al, 2006; Kintsch and Greeno, 1985; Mayer & Hegarty, 1996; Schoenfeld, 1992; Vilenius-Tuohimaaa et al, 2008; & Zende, 1983) maintained that pupils' failure on mathematical word problems is due to a lack of linguistic knowledge. The area of investigation as accounted in earlier studies is similar to the case of the current study's investigation.

This research was verified as a reaction to the researchers' experience with struggling readers and problem solvers across all content area of English and math teacher education courses at Yarmouk University. Successful EFL students speak, read, write, and listen to each other so they can comprehend, recall, and implement mathematical concepts. Word problems and math vocabulary, sometimes, confuse students. To grasp that difference, students should connect English literacy skills to math. This research explains Yarmouk University undergraduates' use of reading literacy strategies (i.e. problem solving) in relation to their command of English language in the subject of math.

For this purpose, the following research questions were addressed:

- ❖ What strategies do undergraduates report using in their problem solving strategies in mathematical word problems that are written in English as an index of their literacy?
- ❖ Are there any typical attitudinal or gender differences regarding undergraduates' strategy use?

2. Methodology

In the current study, the researchers assessed undergraduate Jordanian students' strategic problem solving literacy in comprehending English and in comprehending math. The study adopted Polya's (1957) word problem test and assessed individual undergraduate student's proficiency level. Furthermore, the current study examined students' self-perception regarding understanding English and math (through open-ended question questionnaire).

2.1 Sample

The population of the study consisted of students at the faculty of education at Yarmouk University. The sample was selected randomly and mounted up to (161) students in the academic year of 2011-2012. The overwhelming majority of the students were females (125 students). Ten students did not specify their gender. Table 1, displays sample distribution according to gender.

Table 1: Distribution of undergraduates according to gender

Gender	Females	Males	Not specified	Total
Number	125	26	10	161

2.2 Instruments

Consistent to the research questions of this study, test questions about the passages were adopted from Polya (1957) to test student's ability to solve mathematical word problems. The problems used for this study are mathematical word problem. In each problem, the question is related to one of Polya's problem-solving strategies. This type of problem was chosen because it is rarely studied at undergraduate context. Fourteen questions were used in this study where each two questions reflect one single problem solving strategy. The strategies in question were as follows (predict; use a variable, direct reasoning, draw a picture, look for a pattern; generalization; work backwards; respectively). Each question was followed by three multiple-choice items. Thus, altogether, 14 questions with 42 items were constructed. This test was piloted, revised, and prepared for final administration. The test was managed concurrently with the criterion measure. In all cases, each item was given one point and no penalty was considered for wrong responses.

The current study allocated increased attention to mathematical problem solving strategies in EFL undergraduates setting. As part of this research, faculty of education students' strategic level was assessed; all designed to improve undergraduate students' literacy skills. Therefore, this study endeavored qualitative data as to explain students' test results. Open ended question questionnaire was developed by the researchers; where students were asked to speak openly about their feelings, attitudes, and their self-perception in the subjects of English language and math. This was intended to explain and validate the results obtained by the test scores.

The instruments were moderated by jury of educationalists who are specialist in EFL (3 professors), math education (3 professors) and curricula and instruction (2 professors). Their judgments were built on expert knowledge. For those items with language that might be problematic for students, simpler forms were drafted, keeping the math task the same but adjusting non math vocabulary, and linguistic structures; math language was not changed. Math experts checked original and modified forms to confirm that the math content was corresponding.

Problematic structures were removed or reorganized. Linguistic features that were modified according to Abedi et al. (1995) which entailed the following: familiarity or frequency of non-math vocabulary; voice of verb phrase; length of nominal; conditional clauses; relative clause; question phrases; and abstract or impersonal presentations. Before using the instruments (the problem-solving strategy test and the open question questionnaire) in this study, a pilot study of the instruments was undertaken. The instruments were further polished and refined as based on pilot study results. The coefficient alpha reliability was (0.86) for the test.

3. Results and discussion

3.1 Strategies Reported (Question #1)

The major question dealt with was whether Jordanian undergraduates employ strategies in their problem solving strategies in mathematical word problems that are written in English. In order to answer the question, a set of analyses was conducted to find out whether participants performed differently on different mathematical reading questions. And so, the participants took the same test; any difference in performance of the participants on the test should be attributed to their language ability.

Each reading strategy was used in the current study has a goal of comprehension assessment, and as a result, a greater understanding of math specific information. Inherent in this goal is a need for more in depth, or critical analysis and the possibility of remediation. The overall performance of undergraduates' literacy test was moderately low. Data in Table 2, singles out their general level as 'low' as relevant to proficiency in English and math. When data from the fourteen paragraphs are paralleled, differences rather than similarities emerge because, as Table 2 points up, undergraduates' responses to questions vary. Such variation could be attributed to strategy type. As a whole, students reported an exclusive range of strategies.

Significant effects were revealed on the primary measures of word problem strategy. Although Table 2 shows generalization strategy as having scored (0.9063) which is the highest mean score; yet it is still less than 50% of the overall performance on the literacy test. Another relatively high mean score of problem solving strategy was that of direct reasoning (0.8199).

Conversely, different from the reading condensed content subjects of English, reading strategies have hardly been organized specifically for mathematics. Definitions are accessible with words, equations, and proofs. Moreover, texts comprise more charts, graphs, and other visual information not found routinely in other subject textbooks (Barton, Heidema & Jordan, 2002). In the present study, undergraduates' understanding the text is dependent upon their awareness of the associated mathematics. Consequently, students reading math texts written in English are dared to sweep visually from right to left to read descriptive text, but also up and down, crosswise, and left to right to read the math problems set in or offered with the text.

However, the lowest problem solving strategy adopted by Jordanian undergraduates in mathematical word problems was that of 'using a variable' (0.5217). Often a problem requires that a number be determined. 'Use a variable' problem solving strategy represents the number by a variable, and uses the settings of the problem to associate an equation that can be solved to determine the desired number. This strategy is most suitable when: a problem proposes an equation; or there is an indefinite quantity interrelated to known numbers (Polya, 1957).

Table 2: Means and standard deviations of each type of strategies

No.	Strategy	Mean	SD
1.	prediction	0.7081	0.7956
2.	use a variable	0.5217	0.6234
3.	direct reasoning	0.8199	0.7491
4.	draw a picture	0.6164	0.6443
5.	look for a pattern	0.7375	0.7224
6.	generalization	0.9063	0.9956
7.	Work backwards	0.7468	0.7133

With regard to research question 1, the low mean scores of strategy employment in mathematical word problems that are in English indicates that these strategies are of limited utility for purposes of predictability for undergraduates Yarmouk University. In summary, the fact that the magnitude of mean scores was so low tends to support one of the primary points of this study, namely that many different factors or individual differences are involved in the process of learning and that the influence of one factor alone, such as problem solving learning strategies, may not be significant.

Proficient EFL readers employ their own background knowledge and particulars from the text to make judgments, form opinions, evaluate, or generalize. A generalization is a broad statement that applies to many examples, a generalization is a particular type of conclusion. All generalizations are conclusions, but not all conclusions are generalizations (Bernardo, 2001). A generalization is made from a sum of examples or evidences and what they have in common, for example, the climate in Aqaba is generally warmer than that of Irbid. Students find the pattern that indicates the generalization (or rule). It is anticipated that, when undergraduates understand the generalization, they apply it to a new set of words. It is by engaging with tasks that students expand ideas about mathematics and realize that they have the ability to make sense of mathematics by the English language. That is, generalization strategy was the most used strategy among undergraduates in question, where the mean score was as high (if compared and contrasted to other mean scores in the Table) as (0.9063). Consequently, tasks and learning experiences of undergraduates participated in the current study yielded to thinking about key concepts which inspired students to become proficient achievers and learners of mathematics.

According to Oxford (1990), learning *strategies* are actions, behaviors, steps, or techniques. Strategies are mental processes encompass direct manipulation or transformation of the learning materials. The learning result is therefore believed to be contingent on the specific strategies of manipulating or transforming. In the current study, unlike success in foreign language acquisition, success in learning math in a foreign language is considerably more variable.

In the present study, mathematical English word problems in EFL setting presented critical reading problems; for not only can the problem be challenging mathematically, but students facing worry with vocabulary or going through particular reading miscues, this in turn, drive them to be stuck in the process of understanding the written information. In other words, Jordanian undergraduates tend to be not fully aware of problem solving strategies in understanding two substantial subjects, namely; English language and math, which are two fundamental components of literacy. Not only would the variance between the employment of problem solving strategies allow extra clear-cut assessment of the undergraduates' competence to deduce problem solving strategies such as (predict; use a variable, direct reasoning, draw a picture, look for a pattern; generalization; work backwards), but it would also reveal their understanding of linguistic complexity. In their effort to use problem solving strategies, undergraduates participating in the current study attempted to demonstrate their language skills to find the answer of mathematical word problems. In fact in the current study, finding out the answer of each question could measure exactly undergraduate language skills.

In sum, in this study mathematical problems content is used to assess their language and learning strategies. The results indicated that participating undergraduates were identified either as low problem solvers or limited English language proficiency students. That is, students were rated 'significantly low' in math test. Likewise, undergraduates' results in the mathematical word problem test tend to be influenced by their linguistic knowledge (Abedi et al., 1995; Barton, Heidema & Jordan, 2002; Wood & Taylor, 2006) as well as by their attitudes (Ehrman, 1996) which, in turn, hindered word problem solving ability. Other explanations may relate to some less influential factors like gender.

3.2 Gender and Attitudinal characteristics (Question #2)

In keeping with qualitative research procedures, the data for this study consisted of translated open question self-report questionnaire. So, in order to understand the reasons behind undergraduate low scores, undergraduates were addressed quite a few comprehension open ended questions that maintained the effect of the both variables of gender and attitude on their test scores. However, the following Table 3 draws conclusions on undergraduates' performance in light of gender differences.

Table 3: Comparison of test performance according to gender

Gender	No.	Mean	SD	DF	t-value	Sig.
Females	121	4.96	1.98	29	-2.08	0.047
Males	24	6.08	2.50			

Gender variable was found to be active in highlighting statistical significant differences in the study's overall performance of undergraduates at Yarmouk University where the significance value at the $P< 0.05$ level was [0.047]. The mean score for female undergraduates was calculated as (4.96); whereas the mean score for male undergraduates mounted up to (6.08); which is obviously higher. That is, male undergraduates at the faculty of education at Yarmouk University employed problem solving strategies more than the females; which is interesting.

Regarding the second variable, i.e. attitude, the following Table 4 displays undergraduates' attitudes towards the subjects of math and English language. There has also been increasing attention among strategy researchers steered at examining learners' attitudinal patterns in a particular educational environment. These researchers have emphasized that attitudes is subject to considerable contextual variation (Ehrman, 1996; Noels, 2001). This highlights how students see the situation, understand events in the situation, and process information about the situation. In most of the studies that have examined attitudes or strategies to date, the indefiniteness of research on learner factors indicates an understanding of the complexities of learning experiences.

Table 4: Undergraduates' attitudes toward math and English language

Attitude	Math	English Language
Positive	98	67
Negative	50	81

The current study reported that undergraduates have positive attitudes towards math, where (98) students out of (161) willingly stated that they liked and enjoyed math. In contrast, (81) students out (161) openly and freely stated that they detested and disliked the subject of English language. Only (50) students expressed that they liked the subject of English language. Concerning the test scores, do undergraduates' attitudes affect their performance on the test?

Attitudes about the learning situation may affect a student's tendency to pay effort in, and carry on learning tasks on a persistent, self-directed basis. Thus, attitudes are located as the focal point of student's learning process since it adopts that attitude to learning condition learning behavior. An attitude is typically supposed to entail of three components—cognitive, affective, and behavioral. (Wenden, 1998). The cognitive component comprises what a person knows or believes about the object of the attitude. The affective component is the degree of like or dislike, approval or disapproval associated with the attitudinal object, such as the teacher and the class. The behavioral component involves of attitudes that incline people to act or perform in a certain manner. According to Wenden (1998), the types of attitudes that are fundamental to learner autonomy are those concerning learners' assessments of their own learning.

Independent sample T-test was carried further, it was found out that (as can be seen from Table 5) undergraduates' attitudes towards English language did affect their performance on the test.

Table 5: The effect of attitudes towards English language on the study's test

Attitude type	No.	Mean	SD	t-value	Sig.
Negative	79	4.78	1.97	-0.24	0.027
Positive	63	5.63	2.44		

There was a significant difference in the mean scores of graduates' attitudes towards English language on their performance on the test where the significance value at the $P< 0.05$ level was [0.027].

Table 6: The effect of attitudes towards math on the study's test

Attitude type	No.	Mean	SD	t-value	Sig.
Negative	46	4.87	2.25	-1.03	0.307
Positive	96	5.28	2.20		

Independent sample T-test was carries further, it was found out that (Table 6) that undergraduates' attitudes towards math did affect their performance on the test. There was no statistically significant difference in the mean scores of graduates' attitudes towards math on their performance on the test where the significance value at the $P< 0.05$ level was [0.307].

3.3 A general note on students' self-reports

Having been "spoon-fed" at secondary school, students expected a dynamic, strategy-oriented teaching style in order to make the most of their classroom learning. They seemed to be unhappy with being "consumers" of learning English language and math, and they gave the impression that they could be "producers" of their own learning. Obviously, they were sensitive to any variance in teaching styles between teachers and to different types of lessons, as students remarked in the self-report they made.

All the students showed that the source of boredom in English language and math subjects was the teaching style. A feeling that was expressed by about half of the students was that their teachers were not mainly compassionate or friendly. One student wrote: "my teacher's teaching does not accommodate different levels and needs of different students. Teachers were enthusiastic only with the excellent students. I did not like the classroom atmosphere". Lastly there was also a sense of learned weakness among the undergraduate students. One student commented that: "I have many problems with my English as well as with my math, but I have no idea what I should start with". All of the students openly confessed that they felt a sense of helplessness and a sense of loss of confidence. However, two themes emerged from the analysis of the data :(I) conceptualizing English language learning; (II) Conceptualizing math learning.

3.3.1 Conceptualizing English language learning

Most students who participated in the current study evaluated their English negatively and they were mostly explicit about the problems met in English language learning. A wide range of language learning conceptions emerged among the targeted undergraduates. Most remarkably, very limited number of students referred to English learning as a very important part for their future career. One student wrote: "I think I've already understood simple English grammar very well at school; now the main problem for me is to know vocabulary". Also, frequently referring to English learning as a process of mastering linguistic knowledge where they have no practical command of using English. One student wrote: "I, generally, hate English language".

Almost all students seemed to recognize that English learning is 'awful' where the foremost problem with their English language, as one student indicated is that: "I'm very weak in the basics of English, the basic grammatical knowledge". Most students felt that their foundation in English was not good and that they "needed to have more knowledge".

Some students touched upon the issue of the English language teacher, suggesting that they 'resented' the language itself because of the teacher and that brought them bad consequences. An example reported by one of the students has difficulty in understanding any English text. One student wrote: "failure to understand English is regarded as teacher-bounded".

Absence of maintaining language sense by English language teachers was another remarkable notion repeatedly mentioned by over half of the students in this study. Language sense, in the view of one of the students, was something that indicates that "one can use the suitable language at the proper time without much thought". Unfortunately, students seemed to be uncertain that "one could obtain language meaning if one engaged oneself in the language without the apt aid of a proficient teacher".

3.3.2 Conceptualizing math learning

Some of the students who responded to this study attributed their math learning achievement to the math teachers at the secondary school. Large number of students wrote that they were "very interested and attentive in everything the teacher taught in class". They stated that they were motivated and kept up on the right track by their teachers. Math subject was appreciated and valued by the students participating in the present study because their teachers played a facilitative role as guides not only for math learning but also for personal development. As one student labeled in her self-report: "From my school math teacher, I have learned how to get along with others. This is useful not only for my study but also for my character development"

The majority of the students, however, felt negative feelings for the subject of math where they had teachers at school who were too "rigid or too traditional", as one student wrote. The major drawback as cited by most of the students was: "The teacher just lectured in front of the blackboard most of the time"; "We have rarely had any opportunity to develop strategies in English in the class".

4.0 Recommendation

University students need to connect literacy skills to math in order to develop, explain themselves and communicate to others. Embedding these strategies in their instruction will help them gain the required literacy skills. The problem solving strategies suggested by Polya (1957) include mathematical words problems in order to reinforce reading comprehension skills that apply to mathematics. Additionally, research designed to help FL learners enhance their word mathematical problem solving is very rare, particularly in Jordan, when these problems are in English language which is taught as a foreign language. Consequently, more research is needed to clarify these and other problems related to mathematics achievement of EFL students.

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Appendix 1:

Circle the symbol of the right answer:

1-The cinema has 47 seats in each row and has 52 rows of seats. Predict whether the student body of 2,340 can attend the film in one performance.*(a-No b- Yes c- can't determine)*

2-A light bulb burns for about 1,800 hours. If the bulb continued on all the time, would it last a year? (*a-No b- Yes c- can't determine)*

3-The age of Ali is 4 times the age of his son. However, six years ago, Ali was ten times the age of his son. How old is Ali Now?(*a-36 b- 20 40)*

4-The football team played a total of 35 games. The numbers of wins and losses were the same, but the number of ties was half the number of wins. What was the team's win-loss-tie record? (*a-14,14,7 b-14-7-14c-10-20-5)*

5-How many centimeters are in 18 meters? (*a-1800cm b-18000cm c-180)*

6-How many grams are in 2.3 kilograms? (a-*23000g b-2300g c-2.300g)*

7-Susan is standing between Amy and Mary. Salma is in front of Mary and behind Carla. In what order are the 5 girls standing*?(a-Amy-Susan-Mary-Salma-Carla; b- Salma-Carla-Amy-Susan-Mary; c-Carla-Salma-Amy-Suzan-Mary)*

8-The 126 third-grade students voted in the election for class leader. Ali got all 59 of the boys' votes. 38 of the girls voted for Mary and the rest voted for Salem. How many votes did Salem get*?(a-97 b-38 c-29)*

9-A bank has different interest rates for its accounts. Deposits from JD1 To JD500 earn 0.03 on each JD; up to JD1,000, 0.04 on each JD; up to JD1,500, 0.05 on each JD. If Jane deposits JD760 in an account, how much money will be in the account after one year?(*a- 30.4 b-790.4 c-1125)*

10-. The guidelines for Jone's stalactite kit tell the grower that at a temperature of 45° the stalactites will grow 1.5 in. a day. At a temperature of 50° the stalactites will grow 2.0 inches a day, and at 55° they will grow 2.5 in. a day. How much will the stalactites grow a day at 65°? (a-*3.0 inches b-3.5 inches c-4 inches)*

11- Mary had JD50.00 in her bank account the first week, JD100.00 the second week, and JD150.00 the third week. How much money will she have after eight weeks?***** Circle the statement that is a generalization for this Problem:

a-Statement 1: *Mary had JD50.00 in her bank account her first week and JD150.00 the third week.*

b-Statement 2: *Mary deposits JD50.00 every week. So the number of weeks times JD50 equals the amount of money in the bank.*

c-Statement 3: *Mary has JD100.00 in her account the second week and JD150.00 the third week.*

12-The sum of two odd numbers and two even numbers is: (a-*Odd b- Even c- can't determine)*

13-The tenth grade uses the school library from 9:45 A.M. until 10:30 A.M.; the fifth grade uses it for the next 40 minutes; and the first grade uses it for the next 45 minutes, until the school lunch period. At what time does lunch period begin? *(a-11:30 b-11:50 c-12:45)*

14-The bus for school leaves at 3:10 P.M. It will take Steve 45 minutes to drive from his house to the station, 10 minutes to park, and 20 minutes to buy a ticket and board the bus. At what time should Steve leave home? *(a-1:30 b-1:55 c-12:45)*

Appendix 2:

***please, now express yourself freely regarding the following two issues :(YOU CAN WRITE IN ARABIC LANGUAGE).**

1-what are your views, attitudes, feelings and perspective towards the subject of English language?

2-what are your views, attitudes, feelings and perspectives towards the subject of mathematics?