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Undergraduate ESP Students' Reading Comprehension and Metacognitive Awareness across Discipline and Gender

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ABSTRACT

The aim of this ex-post-facto study was to investigate Iranian undergraduate ESP students' reading comprehension (RC) and use of metacognitive strategies (MCSs) across discipline and gender. The participants included eight groups of junior university students who were taking the three-credit ESP course. Two groups were selected from each discipline each including 30 participants. To collect the research data about the participants' RC, the RC section of the Preliminary English Test (PET) was employed, and their use of MCSs was measured by administering the metacognitive section of the Strategy Inventory for Language learning. The analyses of the data through two-way ANOVA revealed that the participants did poorly on the RC test regardless of gender and discipline Their use of MCSs, however, was significantly impacted only by discipline with computer and mechanical engineering students reporting more frequent use of MCSs. The findings underscore the weaknesses of ESP undergraduates' in RC and use of MCSs as well as their need for some metacognitive awareness-raising. The implications will be discussed.

Key Words: Discipline, Gender, Metacognitive Strategies, Reading Comprehension

1. INTRODUCTION

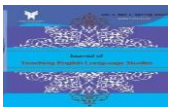
The goal of second and foreign language (ESL/EFL) teaching is to assist the achievement of pedagogic aims and maximize learning outcomes for the participants in different contexts and with different aims. This aim is quite compatible with the goals of post-method pedagogy and its reliance on individual differences. Research findings since the third quarter of the 20th century have discerned and underscored the significance of individual differences causing the yawning chasm between teachers' input and learners' output on the one hand, and the qualitative and quantitative differences of intake among various learners on the other hand. Such differences, as suggested by Ellis (2015), emanate from varying cognitive, affective, and sociocultural characteristics that learners bring to the task of language learning the identification of which at the onset of the learning process can help to enhance instructional effectiveness (Long & Doughty, 2012).

one of the learner-related traits that must be identified is the purpose of learning that can make learning meaningful. A particular group of learners with specific needs in learning English are university students majoring different disciplines including science and engineering as well as social and human sciences. English for Specific Purpose (ESP) students have varied needs depending on their specific field or profession, and tailoring English instruction to meet these specific needs is essential for effective ESP teaching and learning. Among common needs for ESP students across different domains are specialized vocabulary relevant to their discipline, comprehension skills that enable them to understand presentations and discussions related to their field, and sharpened reading skills that allow comprehension of technical articles, journals, manuals, and other written input (Cowling, 2007). In fact, ESP aims at integrating language learning with meaningful content or subject matter targeting specific language needs within academic contexts, to enhance learners' language proficiency and communication skills in authentic and relevant contexts.

One way to help ESP students achieve the goal of comprehending technical input is to promote their ability to digest the meaning of general texts by tackling linguistic and textual intricacies. According to Nation and Newton (2009), the focus in reading classes should be on recurring features that are common to various text types the learning of which can relive the burden on the reader since they can be generalized to various passages. Among such recurrent features that need to be taken into consideration are reading strategies like skimming, scanning, using context clues, guessing unknown words, and other strategies the application of which can help learners overcome blocks to comprehension. Yet, application of such strategies depends to a large extent on the readers' being aware of them and having the capacity to monitor their performance while reading. This has been referred to as one's metacognitive orientation which determine the extent of one's capacity to inspect and self-edit his performance.

2. REVIEW OF LITERATURE

In EFL contexts, RC is considered as an urgent need for almost all ESP students since this receptive skill enables them to access the vast body of information that is conveyed through written texts such as articles and research papers. Such research-generated input can facilitate the achievement of short-term objectives like success in content-based English exams and offer opportunities for technical vocabulary development



and employment of critical thinking and analysis through evaluation of credibility of sources, identifying main ideas, drawing inferences, and analyzing arguments. (Logan et al., 2015).

However, ESP students may encounter several challenges in RC, which can vary depending on their field of study or profession. Some of the major problems faced by ESP students in RC may range from understanding complex and technical vocabulary and terminology to restricted reading strategies and MCSs that can perniciously impact their comprehension of linguistic, organizational, and cultural content (Oxford, 2011). Addressing these challenges requires a multifaceted approach that includes explicit instruction in reading strategies, vocabulary development, cultural awareness, and critical thinking skills, as well as providing opportunities for extensive reading practice and exposure to authentic ESP materials (Chung, 2016; Tran & Tham, 2019). A fundamental need that ESP students may have is their general RC skill and awareness of a set of MCSs the function of which is to help learners self-monitor their performance while learning.

Nevertheless, a large group of university students studying various academic disciplines and a majority of experts and specialists whose native language is not English can hardly achieve this level of language proficiency growth. Despite a rich knowledge of content and academic maturity, they find it agonizingly arduous to communicate their ideas with the world because of lapses in English language skills. This problem is more discernable in EFL contexts, like Iran, where university students enter university with a very basic knowledge of English grammar and vocabulary learned in teacher-centered high school classes. The most frequent activity Iranian English high school teacher do is to assist students develop their test taking skills to get a good score on the English Sub-test of the National University Entrance Examination, which is a multiple-choice test based on the high school English course contents. This method of teaching and evaluation is applied to all learners regardless of their individual differences and has had deteriorating negative impacts on English pedagogy in Iranian high schools.

Quite expectedly, the students who get admitted to university are not well-equipped with appropriate tools to pursue their English studies. All undergraduate university students are obliged to take a three-credit ESP course where they review basic language skills and sub-skills in relation to the specific academic content they are studying. The focus in these ESP curses is mainly on comprehending written content-based input which can be developed only if learners are taught how to tackle various texts using various reading strategies and become capable of strategic reading and metacognitive evaluation of their performance. Unfortunately, most of these ESP undergraduates usually fail to achieve this course objective for different reasons, e.g., inadequate linguistic and topical background, lack of interest in the topic, large number of students in the classrooms, inadequate knowledge of reading strategies, unaccountable teaching methodology, etc. Such failure may lead to subsequent discouragement and loss of initial interest in English as well. Under such conditions and in alignment with the principles of ESP course design, the initial step that may inform subsequent stages of ESP pedagogy seems to be identification of the linguistic and strategic needs of the students. Designing ESP courses that can help undergraduate students overcome these challenges, according to (Cowling, 2007; Isik, 2017; Wang et al., 2020), requires careful consideration of their academic, professional, and language needs, as well as adequate teaching of strategies (Afflerbach et al, 2020).

ESP research is of particular significance and practical relevance to language pedagogy specially in exposure limited EFL contexts like Iran What this deficiency may bring about is unwillingness to learn and loss of initial interest in English. Thus, an educational challenge in any ESP program would be the identification of the participants' initial levels of English proficiency and RC in particular and finding out

the extent to which they have developed their strategic competence with a focus on the metacognitive capabilities.

A plethora of studies has delved into EFL learners' strategic awareness and knowledge and the application of strategies among ESP students (Behtash et al, 2019), learning to read collaboratively (Koohafkan et al., 2021), gender (Green & Oxford, 1995; Phakiti, 2003; Politzer, 1983; Poole, 2005), motivation and test performance (Tavakoli, 2009), and academic discipline (Hong-Nam & Leavell, 2011; Ofodu, & Adedipe, 2011). The findings underscore the necessity of a set of cognitive and MCSs that might be effectively used to enable the learners to control numerous aspects of the learning processes. A major contribution that researchers can make under such conditions is to probe ESP students' threshold level and provide insights for curriculum and material developers as well as teachers. Hence, the present study set out to investigate RC and the use of MCSs by Iranian male and female university Junior's learning in ESP courses for non-English disciplines. To this end, the following research questions were formulated in the present study:

1. Does gender and discipline have any significant interaction impact on Iranian undergraduate ESP students' RC?
2. Does gender have any significant main impact on Iranian undergraduate ESP students' RC?
3. Does discipline have any significant main impact on Iranian undergraduate ESP students' RC?
4. Do discipline and gender have any significant interaction impact on Iranian undergraduate ESP students' use of MCSs?
5. Does gender have any significant main impact on Iranian undergraduate ESP students' use of MCSs?
6. Does discipline have any significant main impact on Iranian undergraduate ESP students' use of MCSs?

Based on the research questions, the following null hypotheses were formulated:

1. Gender and discipline have significant interaction impact on Iranian undergraduate ESP students' RC.
2. Gender has significant main impact on Iranian undergraduate ESP students' RC.
3. Discipline has significant main impact on Iranian undergraduate ESP students' RC.
4. Discipline and gender have significant interaction impact on Iranian undergraduate ESP students' use of MCSs.
5. Gender has significant main impact on Iranian undergraduate ESP students' use of MCSs.
6. Discipline has significant main impact on Iranian undergraduate ESP students' use of MCSs.

3. METHODOLOGY

3.1. Design

This ex-post-facto research was undertaken to examine undergraduate ESP university students' RC and metacognitive strategy use across gender and discipline as two moderating variables. The selection of the research variables was in line with the importance of RC for ESP students and the problems they face in comprehending written input in English.

3.2. Participants

The participants in the current study comprised a sample of 240 female and male Iranian college junior undergraduates from five disciplines, chemistry, mechanical engineering, computer engineering, educational psychology, and management who were taking the three-credit ESP course. The selection of disciplines was made for two reasons. Firstly, these disciplines represent two major fields: Science and Humanities which might, in turn, represent two more general tendencies in learning styles and preferences. Secondly, these disciplines were more popular among university students which made it easier to implement the study. Most of the participants were in their early 20s with a few exceptional cases aging either below twenty or above thirty. In engineering disciplines, the majority of the participants were males while the reverse was the case in educational psychology and management disciplines.

3.3. Instruments and Materials

The research data used to collect the research data were a general RC test and the metacognitive section of Strategy Inventory for Language Learning (SILL) (Oxford, 1985). The RC section of the Preliminary English Test (PET), which is a standardized first level Cambridge English exam for speakers of other languages at intermediate level, was administered to all groups of participants. The test consisted of five different reading tasks and a total of 35 questions the answer to which required the test takers to apply reading strategies like skimming and scanning. The content of PET is drawn from the real world and is adapted to the level of the examination. The test takers' attention was drawn to timing, and they were required to answer the questions in 45 minutes.

Right after the RC answer sheets were collected, the metacognitive component of Oxford's SILL (1985) was administered to the groups (see Appendix B). It served a sort of metacognitive needs-analysis. Because the participants were majoring different disciplines and had a relatively moderate to weak command of English, the translated version of the questionnaire was used after it was piloted with a group of 60 students from the same backgrounds during the summer semester. This pilot study revealed a few problems in the translation of the sentences and helped the researcher to revise the sentences to make them more comprehensible for the participants. Moreover, while the questionnaire was being administered, the teacher first explained the content and was present to answer any probable question.

This questionnaire assessed the participants' use of MCSs in relation to their discipline and gender. The researcher estimated the frequency with which the subjects used the nine MCSs and compared the averages so obtained with the standard averages for each strategy use offered by Oxford (1985).

4. RESULTS AND DISCUSSIONS

Results

The RC test

Like any other quantitative data analysis, first the normality of the research data was checked in order to select the appropriate data analysis test. To this end, the RC test scores were submitted to the Kolmogorov-Smirnov test, the results of which are presented in Table 1.

Table 1

Kolmogorov-Smirnov Test for the RC Test

	Discipline	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Staistic	df	Sig.
RC	1	.22	60	.00	.85	60	.00
	2	.28	60	.00	.89	60	.00
	3	.21	60	.00	.80	60	.00
	4	.27	60	.00	.80	60	.00

a. Lilliefors Significance Correction

The results did not verify the normality of the RC test scores; however, since the study concerned two independent variables requiring the analysis through two-way ANOVA which does not have any alternative nonparametric test, a more stringent significant level, .01, was selected to evaluate the results of the ANOVA test (Pallant, 2016). Table 2 indicates the results.

Table 2

Descriptive Statistics for the RC Test

Groups	N	Mean	Std. Deviation
Management 1	30	9.46	1.27
Management 2	30	9.56	1.13
Psychology 1	30	9.43	1.13
Psychology 2	30	9.53	.93
Mechanics 1	30	9.70	1.05
Mechanics 2	30	9.60	.89
Computer 1	30	9.33	.99
Computer 2	30	9.76	1.04

The results in Table 2 indicates slight differences among the groups' mean scores that were all between 9.33 and 9.76 with standard deviations between .86 and 1.27. The striking finding concerns the very low level of comprehension reflected in the groups' averages.

In order to check any variation owing to gender and discipline, the scores were analyzed through a two-way ANOVA, as depicted in Table 3.

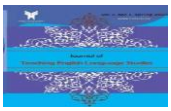


Table 3

The Two-way ANOVA of the Groups' RC Scores

Dependent Variable: RC						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10.317[a]	7	1.474	1.250	.276	.036
Intercept	21546.150	1	21546.150	18274.580	.000	.987
Gender	3.750	1	3.750	3.181	.076	.014
Discipline	2.683	3	.894	.759	.518	.010
Gender * Discipline	3.883	3	1.294	1.098	.351	.014
Error	273.533	232	1.179			
Total	21830.000	240				
Corrected Total	283.850	239				
a. R Squared = .036 (Adjusted R Squared = .007)						

According to Table 3, there was not any significant main effects for gender, F (1,232) =.3.181, p=.076 > .05), nor for discipline, F (3,232) =.759, p=.518 > .05). The interaction effect of gender and discipline did not reach significance level either, F (3,232) = 1.098, p=.351> .05). Hence, the first three research questions were answered negatively, and the corresponding null hypotheses could not be rejected. That is, the groups were poor in terms of their RC with no significant difference owing to gender or discipline.

The Metacognitive strategy use

Research questions four to six addressed the participants' use of MCSs across gender and discipline. To answer these research questions, the mean scores of the male and female participants from different disciplines were calculated and are displayed in Table 4.

Table 4

Means of the Participants' MCS Scores across Discipline and Gender

Groups	1	2	3	4	5	6	7	8	9	10	Total
Management											
Male	2.40	2.71	2.51	2.34	2.32	2.63	2.34	2.46	2.45	2.21	2.43
Female	2.35	2.63	2.45	2.27	2.43	2.51	2.26	2.28	2.31	2.36	2.38
Psychology											
Male	2.67	2.85	2.42	2.58	2.82	2.73	2.12	2.35	2.12	2.23	2.48
Female	2.59	2.73	2.58	2.44	2.69	2.36	2.34	2.54	2.26	2.47	2.50
Mechanics											
Male	2.78	2.91	3.25	2.78	3.14	2.56	2.43	2.34	2.49	2.18	3.48
Female	2.82	3.18	3.42	2.68	3.25	2.69	2.56	2.48	2.56	2.33	2.50
Computer											
Male	2.13	2.53	2.34	2.16	2.27	2.46	2.28	2.31	2.39	2.14	2.73
Female	2.25	2.41	2.47	2.09	2.41	2.75	2.65	2.83	2.48	2.82	2.51

As Table 4 shows, the male Management and Psychology students mean scores were (2.43, 2.48) compared to the female averages (2.38, and 2.50). According to Oxford (1985), both groups were below the moderate level. male Mechanical and Computer Engineering students, however, obtained higher mean scores (3.48 and 2.73) that were higher than those of their female counterparts (2.50 and 2.51). Both groups' average scores were either at or slightly above the moderate level. To probe any probable impact of the participants' discipline and gender on their self-reported use of MCSs, the data were submitted to another two-way ANOVA test the results of which are presented in Tables 5.

Table 5

Two-way ANOVA Analysis of the Groups' MCSs Scores

Dependent Variable: Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.78[a]	7	.25	4.29	.001	.294
Intercept	504.51	1	504.51	8.47E3	.000	.992
Gender	.08	1	.08	1.48	.227	.020
Discipline	1.52	3	.50	8.52	.000	.262
gender * Discipline	.17	3	.05	.99	.401	.040
Error	4.28	72	.06			
Total	510.8	0				
Corrected Total	6.07	79				

a. R Squared = .294 (Adjusted R Squared = .226)

The analysis illustrated in Table 5, revealed no significant main effects for gender, F (1, 428) =.1.48, p=.227 > .05), nor interaction effect for gender and discipline, F (3, .428) =.99, p=..40 > .05). The main effect of discipline, nevertheless, was found to be significant, F (3, 428) = 8.52, p=.001> .05) with a large effect size, .26. Therefore, the answer to research questions four and five were negative and the relevant null hypotheses were not rejected. The answer to the sixth research question, however, was positive and the corresponding null hypotheses was not rejected.

Discussion and conclusion

The findings from the current study verified poor performance of undergraduate ESP students in RC with no significant effect from gender and discipline. As for metacognitive strategy use, however, management and psychology students reported lower levels while mechanical and computer engineering groups reported moderate and above moderate levels of MCS use with no significant gender variation. The findings are congruent with those of Hong-Nam and Leavell (2011), Ofodu and Adedipe (2011), and Coskun (2010).

The results of the present study support the influence of discipline on the participants' use of MCSs. Using the same questionnaire, Peacock and Ho (2003) probed the use of strategies by 1006 Hong Kong Chinese learners attending English for Academic Purposes (EAP) classes in 55 universities. The participants majoring in English were found to be more strategic compared to non-English participants majoring computer, physics, and math students who reported using significantly fewer MCSs. Unlike the findings in the present study, however, they also reported gender differences with females outperforming males in all six strategy categories.

Previous researchers have linked ESP students' weaknesses in RC to lack of monitoring caused by lack of interest (Pintrich & Schrauber, 1992), deficiency in working memory capacity (Siegler, 1998), underdeveloped awareness about how to approach a reading passage (Paris & Winograd, 1990), and low levels of proficiency in English that is characterized by underdeveloped lexical and grammatical knowledge (Recht & Leslie, 1988). Owing to all these problems, weak readers fail to read between the lines and make inferences (Neuman, 1990). The same factors can be discerned in Iranian undergraduate ESP students' inadequate reading performance. Such problems allude to the way these students have been instructed which was mostly based on the traditional view of reading as a decoding process (Baker & Brown, 1984) and are assumed to culminate in nothing but a subsequent loss of interest and motivation. This contrasts with the performance of skilled readers who, according to Cromely (2005), can approach the written input strategically and constantly self-monitor their comprehension of the text.

The great demand for metacognitive awareness might be elucidated based on the view of language learner as an active processor of information and the key role of attentional resources (Schmidt, 1990; Wenden, 1978). The learner can control his learning by managing three important components of the learning process: the learner, the learning process and the particular learning task. To control these elements, though, requires gaining three types of metacognitive knowledge: knowledge about person; about the task, and about strategy and the interaction between them (Flavell, 1979). Wenden (1978) substantiated the interaction between these MC knowledge sources in terms of the readers' need for metacognitive control and self-regulation to manage the learning process at different stages because they are active and dynamic agents whose cognitive structures and knowledge systems are in a state of flux.

The significance of metacognition in promoting RC in ESP courses can also be corroborated in terms of cognitive, social and sociocultural theories.

Cognitively, schema theory (Anderson & Pearson, 1984) posits that readers use their background knowledge or (schemas) to comprehend text. MCSs such as activating prior knowledge, predicting, and monitoring comprehension align with schema theory. ESP students can use these strategies to connect new information with their existing knowledge, facilitating comprehension. Likewise, the proponents of cognitive load theory accentuate the limited cognitive resources of the learners and claim that MCSs help them manage cognitive load by directing attention, planning, and monitoring comprehension. In fact, teaching ESP students to regulate their cognitive processes during reading can enhance their

comprehension (Leppink & van den Heuvel, 2015).

Another learning theory supporting the role of metacognition for ESP students is the social cognitive theory (Bandura, 1986; Zimmerman, 1989) which emphasizes the role of observational learning, self-efficacy, and self-regulation in human behavior. MCSs are claimed to empower ESP students to monitor and control their reading processes, enhancing self-efficacy beliefs and fostering independent learning. Additionally, Transaction theory views reading as an interactive process between the reader and the text and envisages MCSs as tools that can enable ESP students to actively engage with the text, negotiate meaning, and construct understanding (luke, 2000).

Finally, metacognition is closely linked to self-regulated learning (SRL) which is equated with autonomous learning (Pintrich, 2000; Zimmerman, 2000; Ortega, 2007). SRL entails learners' active participation, goal setting, and self-monitoring in the learning process. MCSs, such as setting reading goals, planning, monitoring comprehension, and evaluating understanding, are central to SRL. Of course, SRL is the final stage in the regulation process and can be achieved only if in prior stages of object-regulation and other-regulation, the teachers provide opportunities for students to develop their strategic competence and use these strategies initially with the help of a more capable teacher and finally take ownership of their learning and improve RC skills.

Hence, the role of metacognitive strategy awareness-raising is theoretically sound and practically tested (Zenotz, 2012) and defendable. Incorporation of such activities are in line with the needs of Iranian ESP students and has to be linked to everyday practice of teaching RC, particularly in ESP classes to empower students and help them become more strategic readers in their specific field of study.

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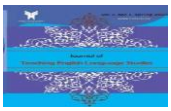

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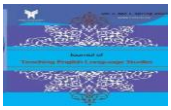

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