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Full Length Research Paper

Mechanism for promoting motivation, confidence, and autonomy through synchronic communication sessions in virtual learning environments

Jorge Andrick Parra Valencia, Adriana Rocío Lizcano Dallos and Eliécer Pineda Ballesteros*

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This study presents a mechanism which explains the effect of synchronous communication on students' perception of the training process in virtual learning methodology used in a postgraduate programme at the University of Santander. We use System Dynamics to design a mechanism that integrates motivation, confidence, trust, and autonomy in students. The results suggest that this mechanism explains why teachers should interact with students to motivate them.

Key words: Mechanism, motivation, teacher immediacy.

INTRODUCTION

The virtual learning methodologies used in the Master's program in Management of Educational Technology at the University of Santander are based on a pedagogical model used for self-regulated and meaningful learning. Students and teachers interact with computer mediated communication.

In virtual learning, autonomous learning is a key variable for achieving a successful learning process. In the literature, some authors suggest that synchronous communication is not essential to help students learn autonomously. However, in our experience with students, the interaction between teachers and students is very important for students to learn autonomously. This interaction, mainly developed by teachers, is done through synchronous communication.

The virtual training process is developed because students are digital immigrants. In this sense, students are

not always naturally fluent with technology. This is one of the reasons most of them choose to study our program. This might make them feel restricted and lack trust in the use of Information and Communication Technologies (ICT) to establish communication with their teachers. If teachers do not use clear guidelines in the management of communication mediated by ICT with their students, students would feel alone in their formative process. In other words, if we want to promote autonomy in the learning process, our students need some kind of synchronous communication with their teachers.

As a result, in this study, we propose a mechanism to explain why students need this kind of communication and how this communication improves their autonomy. This study presents how teachers' immediacy promotes students' confidence, trust, and autonomous learning through ICT communication. Additionally, we are going to

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explain how this problem is studied in the literature.

The question about the role of communication in learning is not new. In learning, communication plays a central role, and it is also important in virtual learning.

Polino (2003) proposes a concept of perception that refers to the process of social communication and its impact on the formation of knowledge, attitudes, and expectations of the members of a group.

Freeman et al. (2013) establishes that computer-mediated communication defines the ways in which communication technologies have created a new scenario of tools to support human communication.

Some authors, according to Constantino (2010), prefer to speak of electronic discourse (ED) and not computer mediated communication (CMC), because the first term focuses more closely on the linguistic nature of the exchange more than the medium or the channel by which the messages are transmitted.

In this way, we claim synchronous electronic speech (SES), which corresponds to real-time conferences, is a spontaneous but written conversation. We are interested in the study of chats and video-conference that impacts the understanding of and even meta-cognition in the exchange of knowledge. Authors have suggested that the main elements that appear in the communicative process are the emitter, message, and receiver (Lores and Beltrán., 2012), and the three fundamental dimensions or links which define and/or determine the communicative process are human, instrumental, and psychological components.

The aim of this study is to propose an explanatory mechanism to improve our understanding of how synchronous communication is perceived by students of a postgraduate program, in order to promote autonomous learning. In the end, we are going to propose how to increase the effectiveness of synchronous teacher-student communication using virtual learning methodology (Table 1). A literature review on Scopus was performed (18th March, 2017) using synchronic communication and perception as key words. The most relevant results were selected to specify the research area. Table 1 presents the main findings.

From previous research, we found that there was no mechanism that explained how synchronic communication promoted students' autonomy in virtual educational settings. Boulos et al. (2005) reports the effect of communication using Paltalk, but suggests more research studies are required. De Lucia et al. (2009) suggests that communication promotes learning using computer games. Finally, Pilkington (2003) reports that the use of chat promotes collaborative learning.

In this study, we understand why some students with low technological abilities can promote their autonomy in learning due to synchronous communication with their teachers. We used System Dynamics to design a mechanism to understand the benefits of communication among these students.

METHODOLOGY

System dynamics were used to design a mechanism that explains how teachers' immediacy in communication can promote confidence, motivation, and autonomy in students of a post-graduate program. The following steps were performed:

1. Defining the relationships among the elements of the mechanism in the literature. We identified elements to be considered in this study mechanism and then created relationships among them. These relationships define feedback loops that generate the behavior of the mechanism. This structure represents the study hypothesis on how communication could promote autonomy in students.
2. Designing the working dynamic hypothesis. This representation is related to elements reported in the literature about the problem. Here we propose how the structure produces a range of behaviors.
3. Designing the simulation model. We develop differential equations to represent the dynamic hypothesis and then define units for all the variables, and check the consistency in terms of unit for the model.
4. Developing simulation experiments. The model allows the study to perform simulations to check if behavior can be explained by the structure.
5. Reaching a conclusion on the dynamic implications of the mechanism. Finally, we analyze the model and the results, and give suggestions about the consistency of the study hypothesis and how to improve the process of communication in virtual settings.

RESULTS

Working dynamics hypothesis

We developed a working dynamic hypothesis that integrates teachers' immediacy and students' motivation, confidence, and autonomous learning capacity. These variables configure a reinforced feedback loop named R1. This feedback loop works as follows:

If teacher immediacy is applied in the virtual environment, then students' motivation increases. As a result, confidence increases also.

We claim these variables explain an increase in students' autonomous learning. This new autonomy then reinforces students' motivation, which closes the cycle. Every variable included in this mechanism has a balance feedback loop (Cycles B1, B2, B3 and B4). We model this as a way to represent a depreciation process in each variable. In this way, if R1 is not promoting motivation, confidence, and autonomy, the depreciation process is going to reduce the levels of each variable. This is presented in Figure 1.

As System Dynamics Theory (Sterman, 2000) and Institutional Design Theory (Valencia, 2012) are prescribed, this mechanism has path dependency. Even with the depreciation we included, reinforce feedback loops depend on the initial conditions. This means, if the initial values are too low, motivation, confidence, and autonomy will not be promoted. Therefore, teacher immediacy should be a tool to promote confidence and motivation in students in virtual settings.

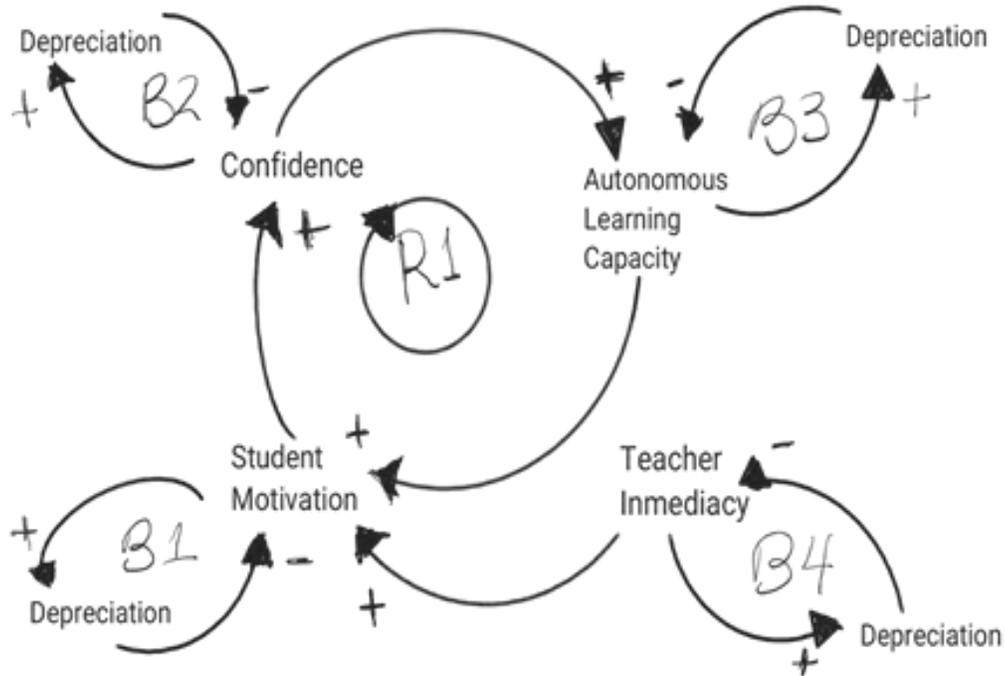


Figure 1. Working dynamics hypothesis.

Forrester diagram

We designed a diagram of Forrester for the study mechanism, which is presented in Figure 2. We used three differential equations to represent how teacher immediacy promotes students’ motivation, confidence, and autonomous learning. The model has the following main differential equations:

1. Student motivation
2. Confidence
3. Autonomous learning capacity, and
4. Teacher immediacy.

Students’ motivation

In Figure 2, we represent the differential equation for students’ motivation. The outflow named “motivation depreciation” defines how students’ motivation is going to decrease because of the depreciation, based on a life time motivation. If motivation increases, then confidence is going to increase. Students’ motivation is related to confidence in a non-linear relationship. This non-linear function is presented in Figure 3. This relationship means that, as motivation increases, that increase affects confidence non-linearly.

Confidence

Similarly, confidence is represented graphically in Figure 4.

Confidence is decreased by confidence depreciation, which depends on a lifetime confidence. If confidence increases, then autonomy will also increase. Figure 5 presents the relationship between confidence and autonomy. When confidence increases, autonomy is going to increase in a non-linear way defined by the function presented.

Autonomous learning capacity

This equation is represented in Figure 6. Autonomous Learning Capacity is decreased by Decreasing Learning Autonomy, which depends on a life time Autonomous Learning. This variable influences feedback motivation. Figure 7 represents the relationship between autonomy and students’ motivation. When autonomy has higher values, then motivation is going to increase.

Teacher immediacy

Teacher Immediacy is represented in Figure 8. This variable is decreased by depreciation, which is a lifetime event. The strategies for teacher immediacy are activated (On) by Strategy Activation and Init Teacher Immediacy, when the value is 1. When the value is 0, the strategy is off. When Strategy Activation is on, motivation is promoted. Figure 9 presents the relationship between teacher immediacy and motivation. At the beginning, there is no change in motivation. However, if the strategy for immediacy takes on a higher value, motivation is promoted.

Table 1. Summary of the literature review.

Reference	Problem	Method	ICT Tool	Conclusion	Number of citations
(De Lucia et al. (2009)	Video games affect learning?	Synchronic meeting in second life	Second life, Moodle	Be part of a learning community promotes learning	174
(Boulos et al. (2005)	Effects of virtual classes in post-graduate programs	Configuration	Paltalk	More re-search required	25
Pilkingto (2003)	Effects of CMC Synchronic and roles in collaborative learning	Application prescriptio	Chat	Not presented	6

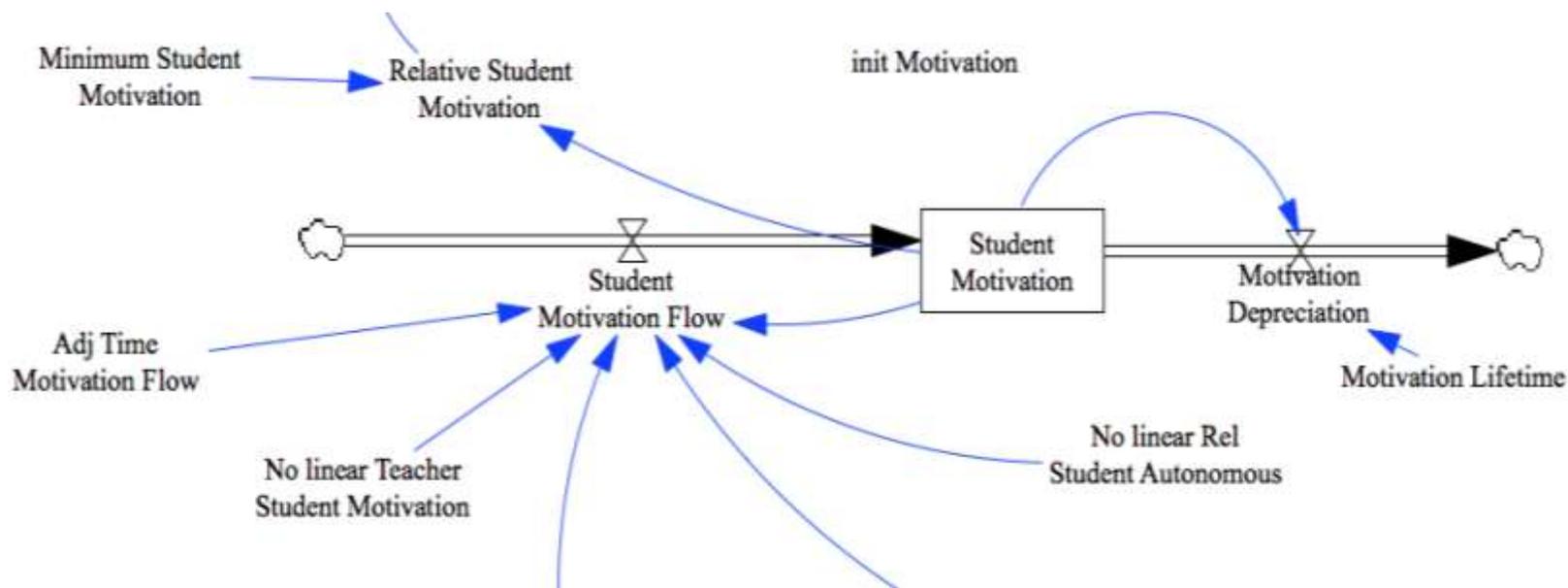


Figure 2. Graphical representation of the differential equation for student motivation.

Finally, the model is represented in Figure 10. The model is solved using Vensim software specialized in designing and solving system dynamics models.

Simulations

The mechanism proposed here was tested using Vensim. The model was tested without teacher

immediacy and as expected, motivation, confidence, and autonomous learning were not promoted. Following that, it was tested using teacher immediacy and, as a result, motivation,

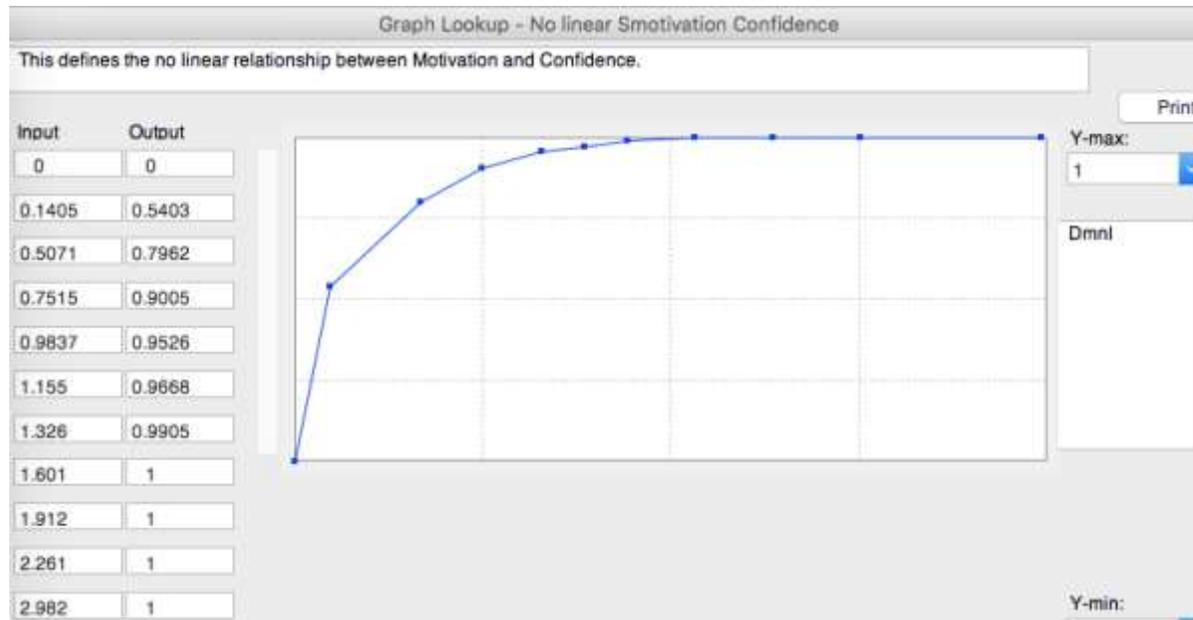


Figure 3. Non-linear relationship between motivation and confidence.

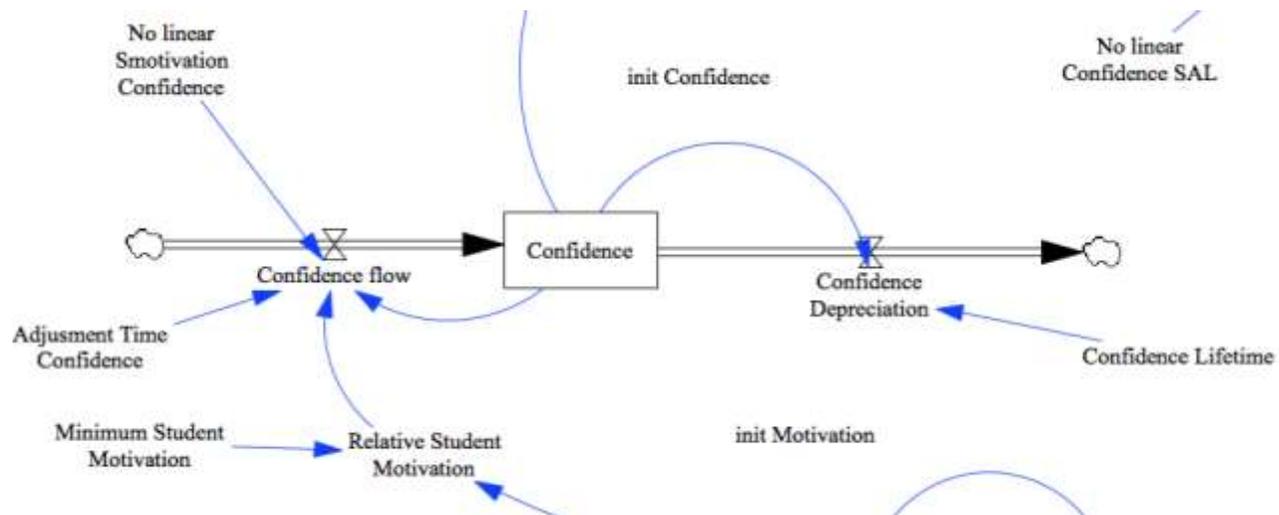


Figure 4. Graphical representation of the differential equation for confidence.

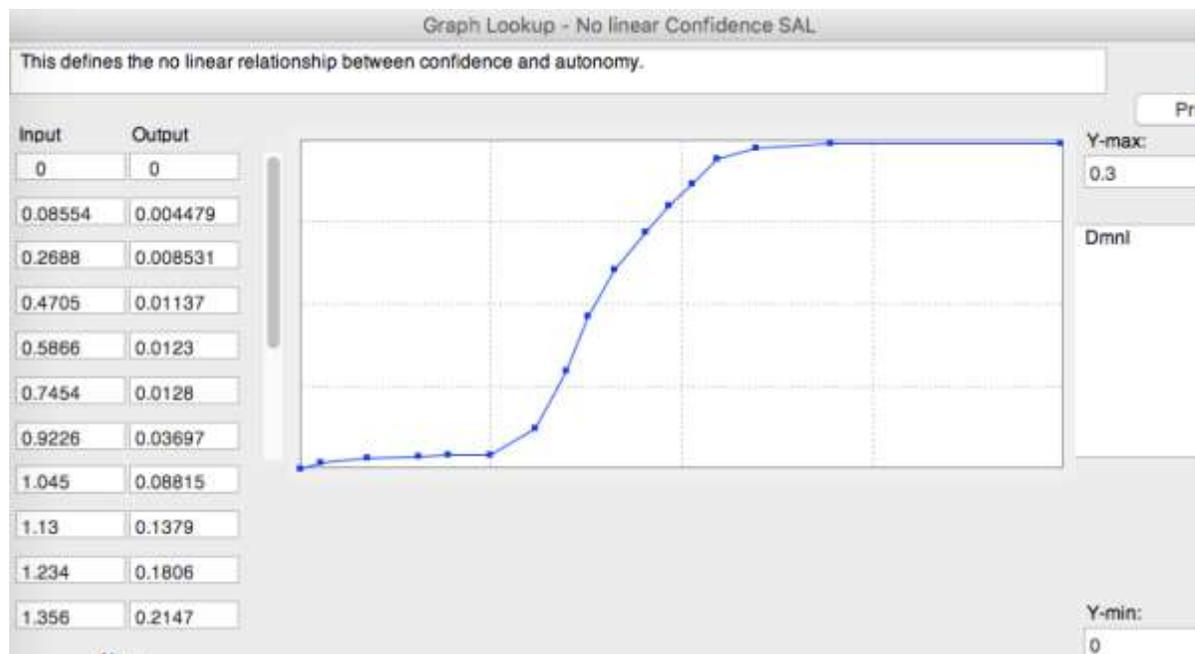


Figure 5. Definition of the relationship between confidence and autonomous learning capacity.

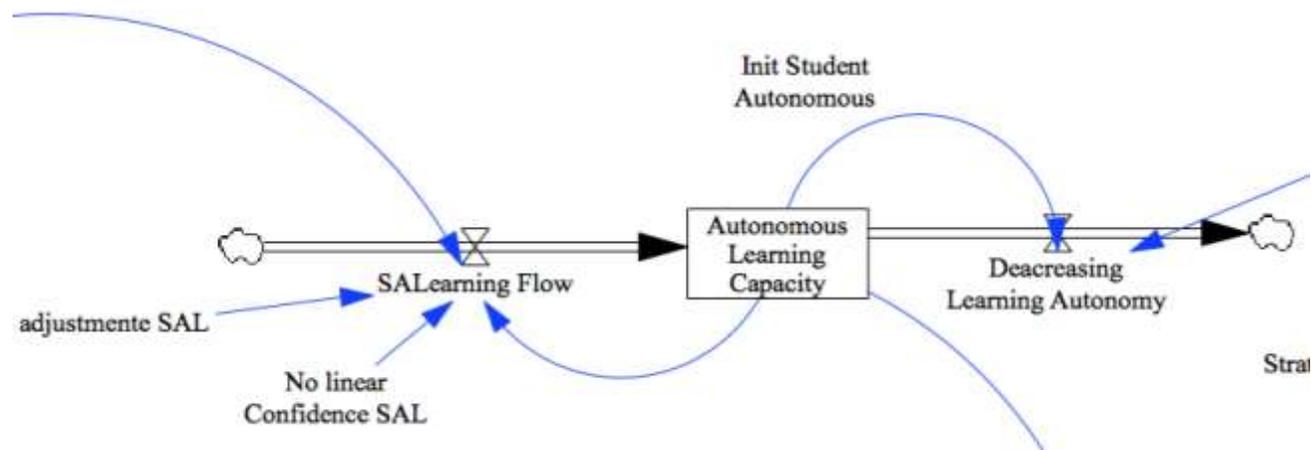


Figure 6. Graphical representation of the differential equation for autonomous learning capacity.

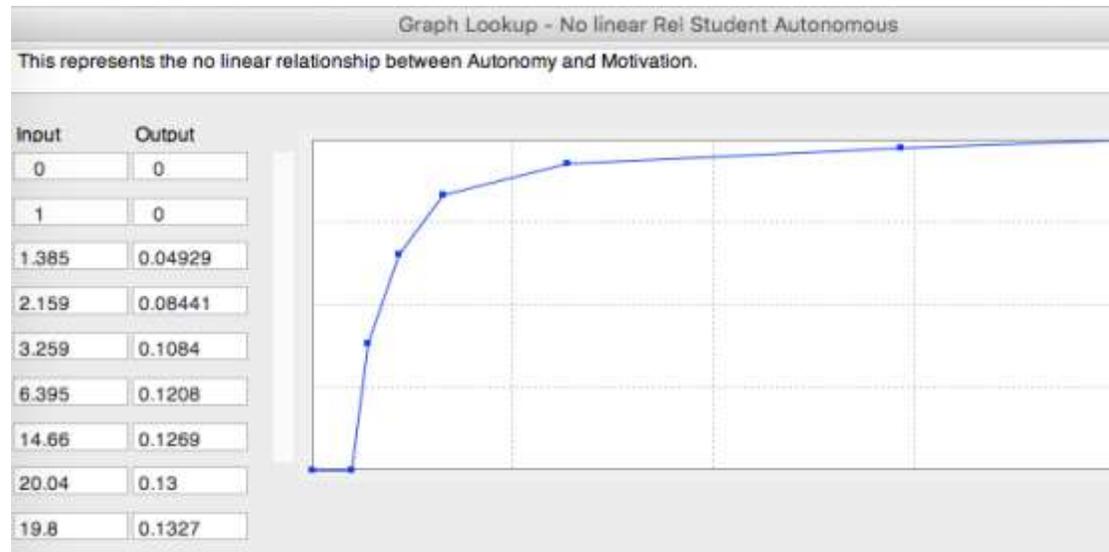


Figure 7. Relationship between autonomy and students' motivation.

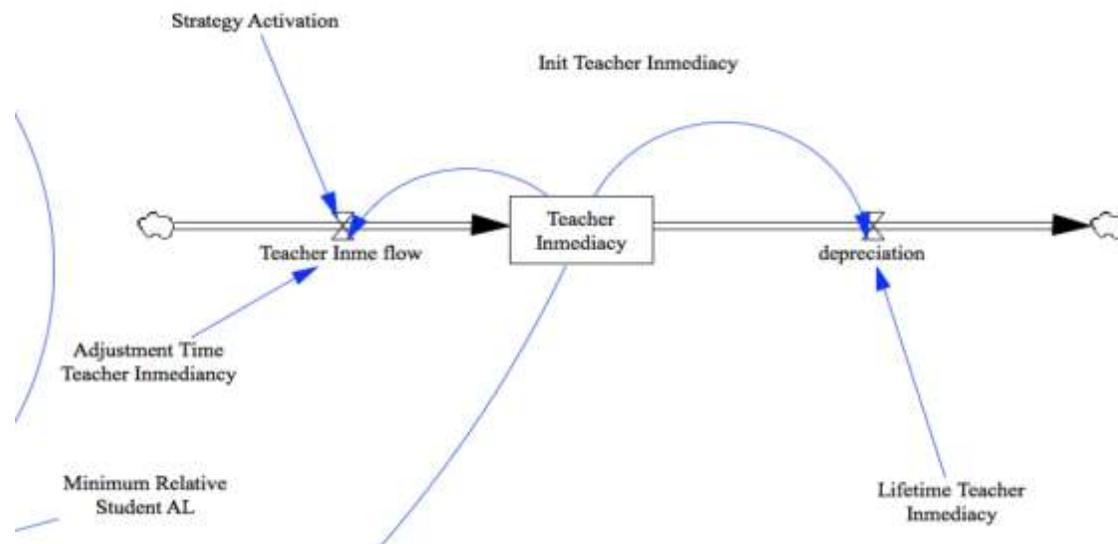


Figure 8. Graphical representation of teacher immediacy.

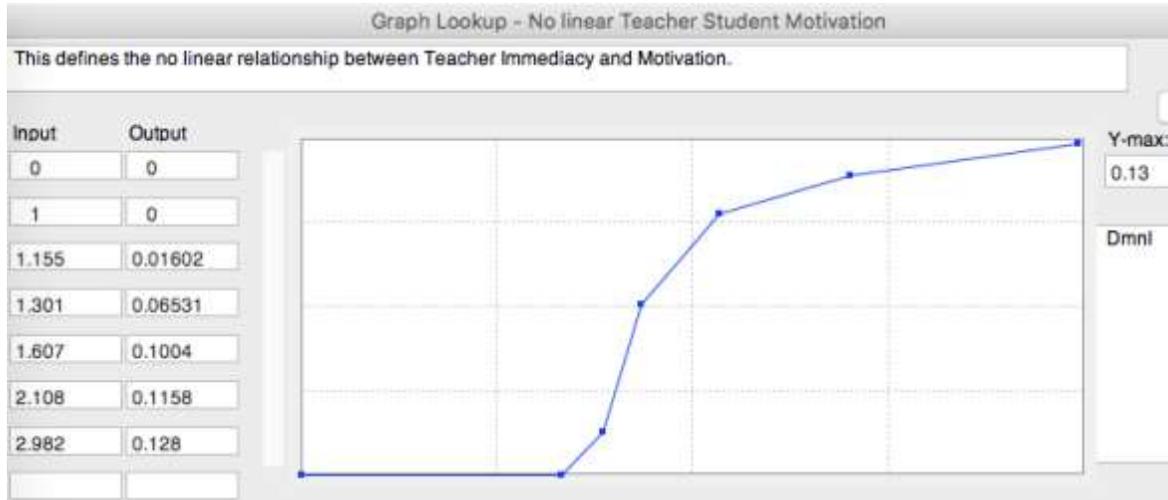


Figure 9. The relationship between teacher immediacy and motivation.

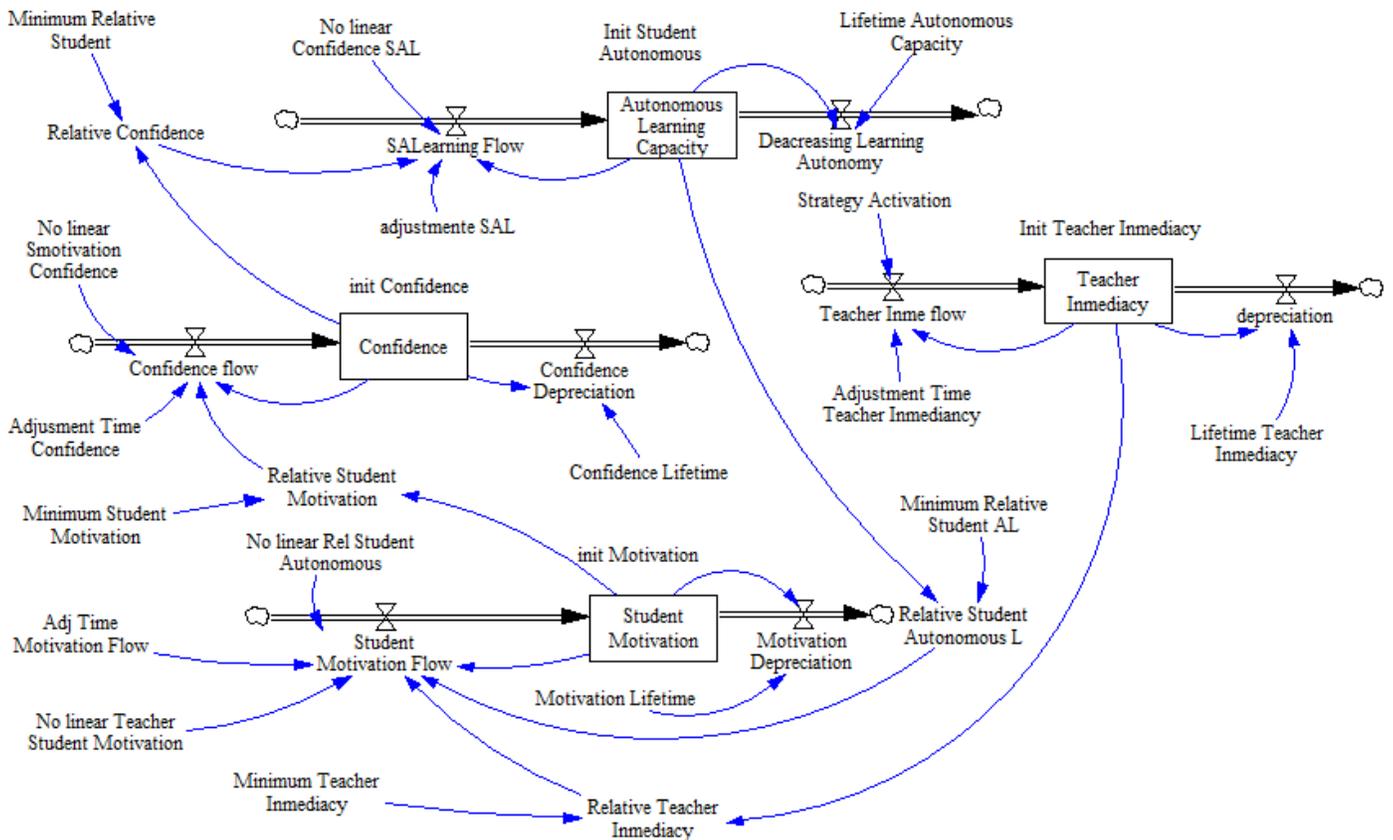


Figure 10. Forrester diagram.

confidence, and autonomous learning were promoted as shown in Figures 11, 12, and 13. Figures 12, 13, and 14 show the effects of simulation of teacher immediacy on students' motivation, confidence, and autonomy. Figure

11 shows clearly the activation of teacher immediacy (red line). The simulation is presented in blue when teacher immediacy is off. Figure 12 presents the nature of students' motivation as a result of the scenarios for

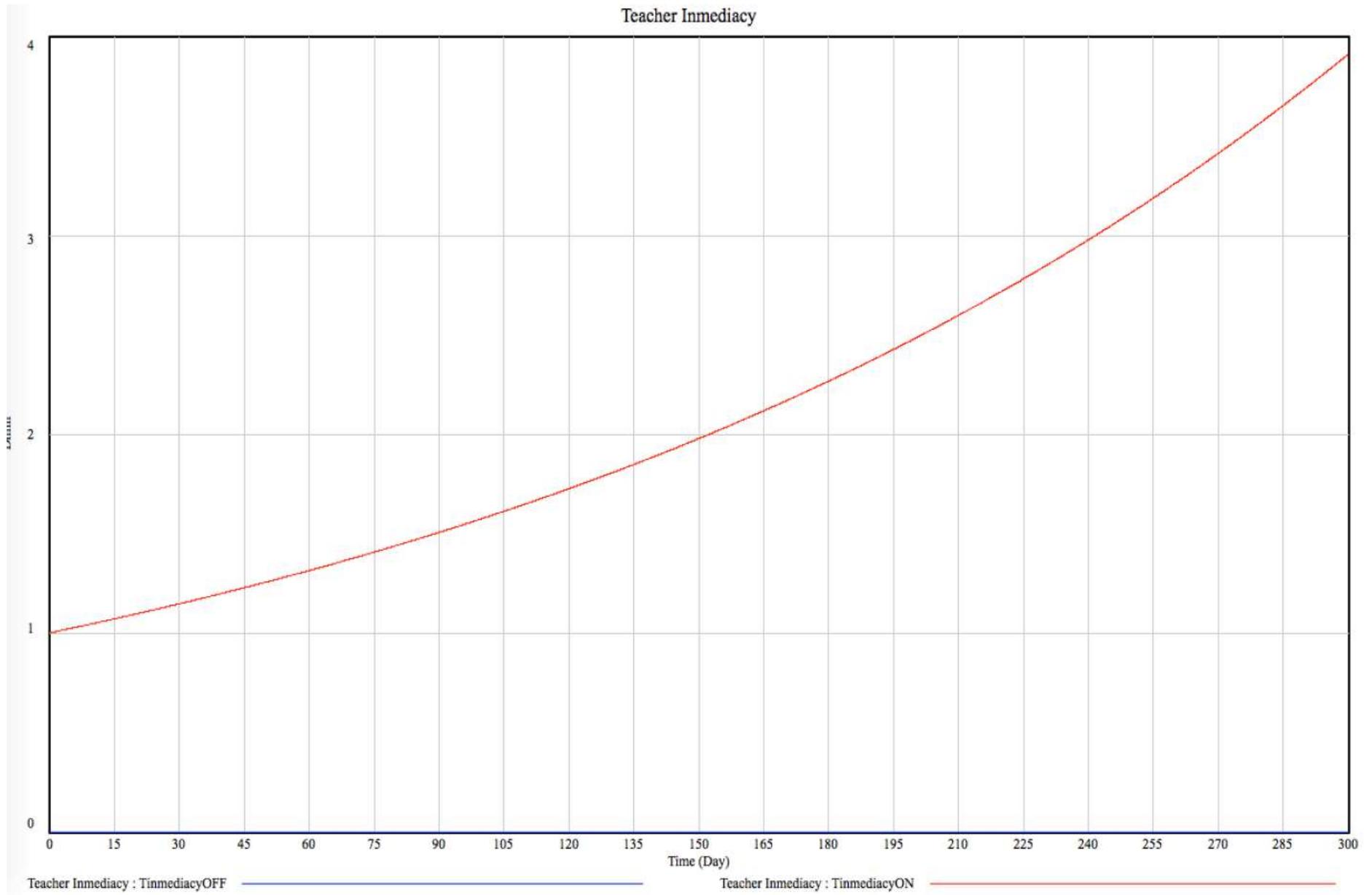


Figure 11. Simulation of teacher immediacy.

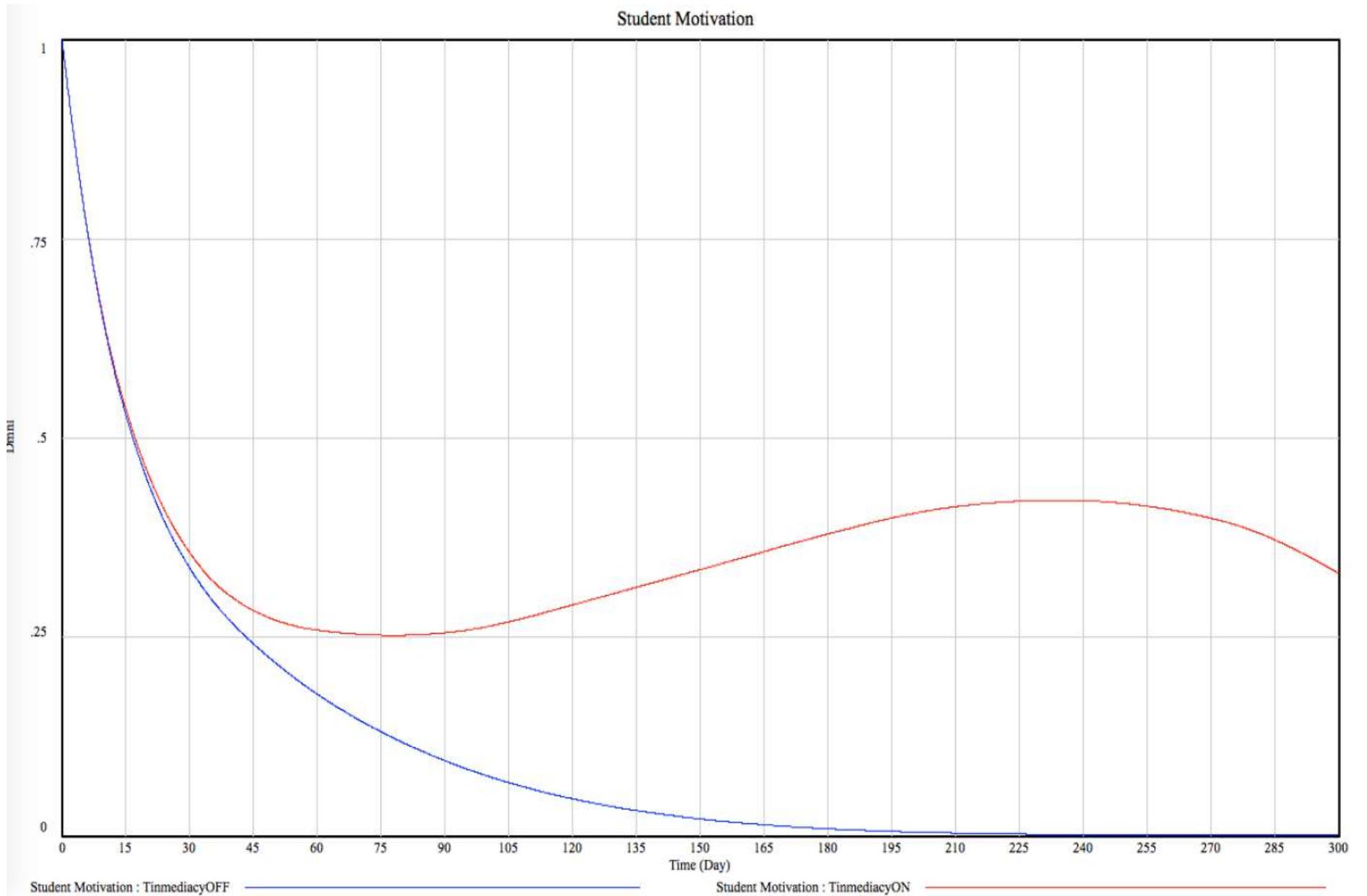


Figure 12. Simulation of motivation.

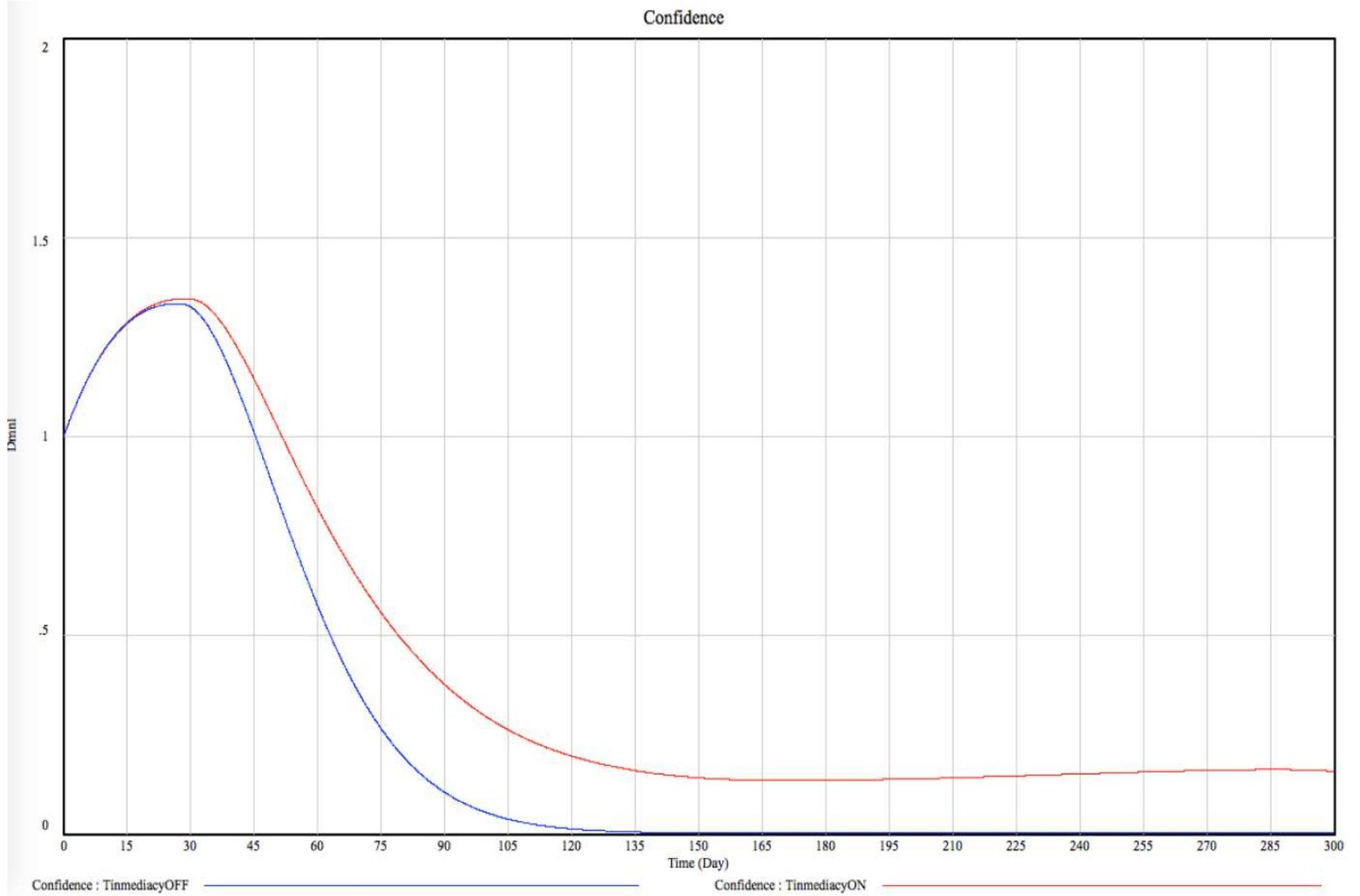


Figure 13. Confidence.

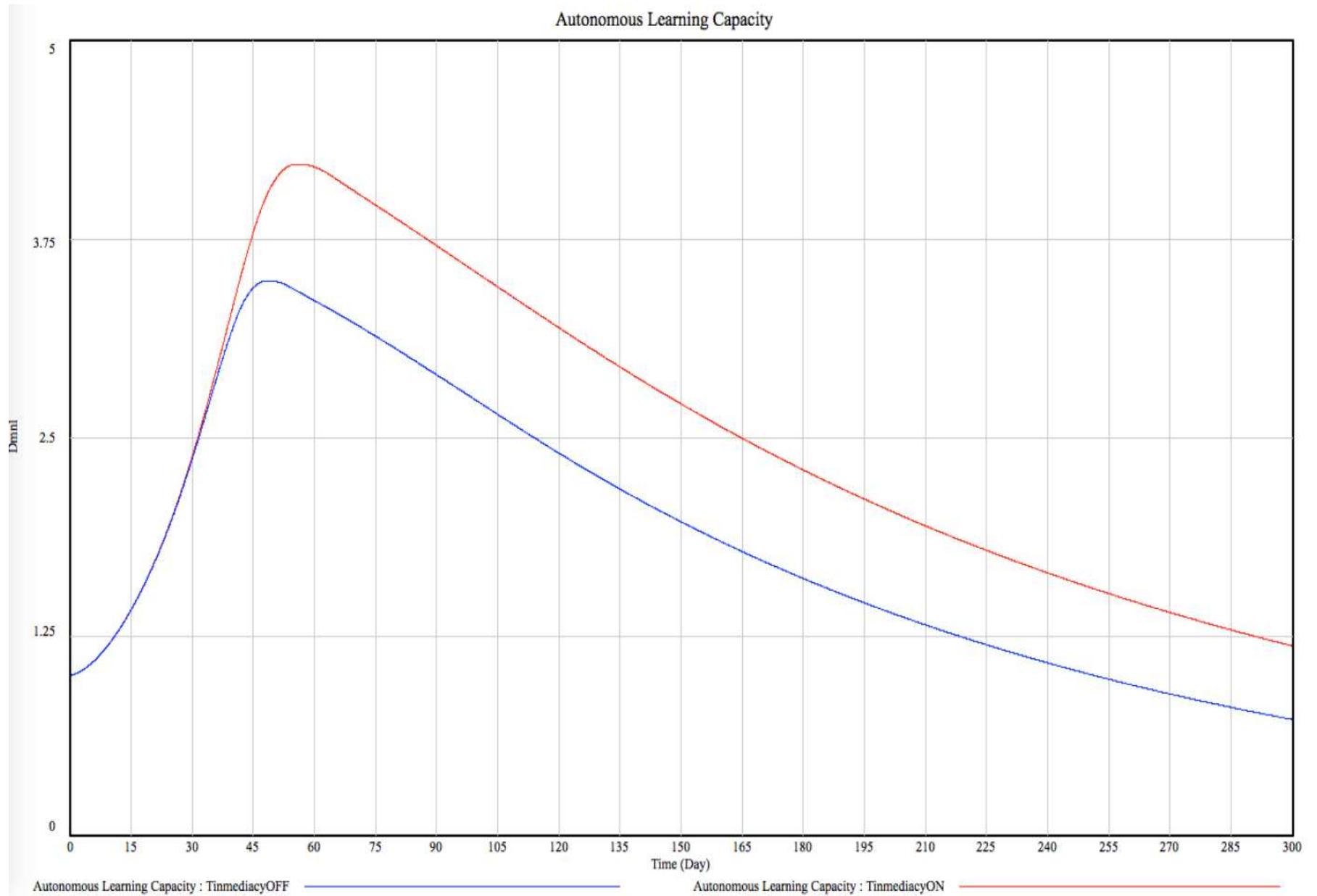


Figure 14. Simulation of student autonomous.

teacher immediacy being ON and OFF. Clearly, we can see how the mechanism promotes motivation. Figure 13 shows similar effects on confidence. Figure 14 presents how confidence promotes autonomous learning capacity. Confidence promotes autonomy more as shown in Figure 14.

DISCUSSION

We developed a mechanism to explain how teacher immediacy can promote motivation, confidence, and autonomous learning. In summary, if teachers promote communication, students' motivation, confidence, and autonomy, which reinforces motivation will be encouraged. This is evident in simulations of how the mechanism explains our experience with students with low ICT literacy. There are some limitations in this study. More research is required to understand why students lose motivation, confidence, and autonomy without teacher immediacy. We developed the model by using our experience and looking for related experiences in the literature. Because of this, we can develop instruments to get data in our classes to adjust and validate the study model. However, the model is useful to explain why it is important to promote teacher immediacy and communication for supporting motivation, confidence, and autonomy. We found path dependence because of the nature of the reinforce feedback loop. This is similar to literature reports in system dynamics (Sterman, 2000) and institutional design (Valencia, 2012). In this study literature review, we did not find reports on this mechanism developed by us. These results are relevant because we can explain now why it is important to promote synchronic communication in asynchrony post-graduate programs.

Conclusion

This work proposed a mechanism to explain how teacher immediacy promotes motivation. This is significant because we understand that it is important to interact with students if we want to promote motivation, confidence, and autonomous learning.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

A study on the barriers to participation of females in science, mathematics and technology education in Imo State the way forward

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A study was carried out to ascertain the barriers to effective participation of females in surface-mount technology (SMT) in Imo State. Four purposes and four research questions guided the study. The study adopted the survey research design. The population of the study consists of all the female science students and lecturers in six tertiary institutions in Imo state. The simple random sampling technique was adopted with a sample size of six hundred respondents. A structured questionnaire was used to elicit response which was analyzed using mean. Findings revealed that domestic issues and responsibilities, culture of marginalization, stereotyping of knowledge and skills are barriers to effective participation of females in SMT. It was therefore recommended that schools should be gender responsive and females should be assertive and stand for their rights in order to move forward.

Key words: Barriers, stereotype, marginalization, science, mathematics and technology.

INTRODUCTION

In Nigeria, the government is increasingly realizing that technological development is mandatory for the country's overall development. During the introduction of formal education in Nigeria, efforts were made by parents to ensure that females did not attend formal education. This was for several reasons one of which was that it was considered wasteful as girls would eventually be married off to become housewives (Bandekale, 2003).

Thus, women formal education was not favoured by parents early enough. However traditional forms of education were available to prepare women for future roles. According to STAN (1992), a constant problem to the continued attendance of girls in school at the early period was withdrawal for early marriage and this was

common in Northern part of the country.

As a result of the foretasted setback, there is under-representation of women in education generally and especially in the field of science and technology. Harding (1987) posits that low performance of women in science, mathematics and Technology can be due to:

1. The assumption the society makes about males and females (their abilities, behaviours roles and aspirations).
2. The objectives and organization of education
3. The practice of science, mathematics and technology.

The aforementioned factors are embedded in the political and cultural context of the society. Maccoby and Jackson

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(1975) gave credence to statement that males display superior spatial skills however argued that equitable distribution and creation of science and technology is a necessary prerequisite for the development and improvement of human beings.

It is critical that the Nation's workforce in a climate of significant and global economic restructuring aims at attaining and maintaining a state of technological and scientific readiness that will enable it to thrive in the global economy. To achieve this, all the sections of the population must be fully developed. A way of achieving this is through the building and encouraging of scientific literacy.

The participation of women in science, mathematics and technology education has been and is still low around the world (Kishore, 2008; McCarthy, 2003; Ellis, 2003). United Nations has recognized the role of women in the development of any country as well as the importance of understanding the gender differentiated efforts of development plan and to this end the platform of Action of the 4th United Nations World Conference on women (1995) noted that women's empowerment and full participation are prerequisites for the achievement of equality, development and peace. Though women are underrepresented in almost every sphere of recognized scientific participation (Macathy, 2003) there is increasing participation in the 21st century (British Council, 2001).

Generally speaking, science subjects like chemistry are given masculine outlook by many educationist, such that girls in Science, Mathematics and technology Education attracts attention. Fegbesan (2010) states that curricular, pedagogic practices and classroom organization hinder the access and retention of girls in science and technology education. Gender mainstream have led to advance studies and women participation in science, mathematics and technology.

Thus, United Nations conventions such as the 1995 World Conference on Women held in Beijing and the world conference on science held in Budapest in 1999 called for the collection of gender disagreed data reflecting women's economic, science and technology contributions (UNESCO, 2014).

According to Orji (2000), some professions like carpentry, engineering, woodwork, Mental work and Automobile Engineering technology are still regarded in some quarters as a no go area for females while nursing and catering professions are seen as exclusive for women.

Technology and Science Education is very important for both men and women alike because it accelerates the pace of change in the world. Science, mathematics and Technology provides the foundation for wealth and development bringing immense improvement to the quality of life and people's ability to interpret the world. The process of Technology Education provides knowledge, develops skills and inculcates attitudes that are necessary for future occupation.

Science, Mathematics and Technology Education is an important tool in National Reforms for development and poverty reduction in the present National Economic Empowerment and Development Strategy (NEEDS) FOR Nigeria. Participation of females in science and technology is necessary, but socialization and traditional roles assigned to the girls at birth still determines the level of participation girls in science and technology, maths education, because the life of the person is influenced or affected by socio-cultural forces. The culture learned directly or indirectly to a large extent determines how the person thinks and feels, directs his or her actions and defines his or her outlook in life.

Viadero (2006) pointed out that differences in brain structure, hormone production or maturation rates may account for differential performance in school-related tasks. Furthermore, the parts of the brain responsible for processing verbal information and control of impulse mature earlier in males, thus Acker and Oathy (1993) reports that females are indifferent in science because they lack analytical and visual spatial skills needed for abstract reasoning to science. The above argument has been proved wrong with the emerging evidence which shows that ability is not a determining factor in performance because girls and boys are found to perform equally well if instructional context is fair and conducive (Campbell et al., 2002; Erinosh, 2008).

According to Johnson (2007), males are more variable on most quantitative and visuospatial ability, which necessarily results in more male at both high and low ability extremes, and achievement to communicate and comprehend abstract ideas effectively. Thus, better performance by males than females contributed to interest, specific brain and cognitive systems.

Furthermore, few females than males have innate ability to succeed in academic disciplines that requires advance mathematical abilities, hence the scarcity of females with exceptional mathematical talent, which explains the disparity in female and female and male ratio in science, mathematics and technology education.

The wide gap between males and females has expired over the years and deliberate efforts have been made by United Nations to address it, the efforts include declaration of a decade for women which culminated in the Beijing conference of 1985, Education for all and millennium Development Goals (UN, 2000; Oldham, 2000; UNDP, 2001). Fegbasan (2010) points that there is a relationship between gender role, orientations and gender stereotype with related variables.

Science plays a central role in contemporary society, with the potential to improve lives in a multitude of ways and advance national development. Access to the fruits of science at the individual and collective levels, however lies primarily with those endowed with scientific knowledge and skills. Thus Science is regarded as the cornerstone of industrial development and the link between technology and socio economic development

(Ekwe, 2014).

Hence closing the gender gap in science is of critical importance for all countries because failure to do so means the loss of vast human resources that could contribute to National development and further entrenchment of gender inequality in the society.

A country's ability to create, apply and diffuse scientific and technological knowledge is now a major determinant of its socioeconomic development and national competitiveness. This potential cannot be fully realized without making the best use of the entire population of a nation including girls and women. There are 69 million women and girls in Nigeria (United Nations Department of Economic and Social Affairs (2010). Their exclusion from the generation and application of scientific knowledge represents a tremendous waste of human potentials.

According to Garder (1984) and Ocho (1985), in Nigeria culture female children are reared differently from males. Girls are protected and discouraged from explorative and risky activities while males are encouraged to be assertive and challenge their mental powers thus socialization leads to certain personality characteristics regarded as masculine or feminine independent qualities such as initiative and assertiveness for boys; dependency, submissiveness and complacency for girls towards science as they believe that they are inferior to boys physically and mentally. Schools specifically play important role in females' access to science by the manner the school curriculum is implemented in Nigeria.

Spear (1985) posits that sex, attitude and teaching approach of teaches influences the attitude of female students, whom they believe view science to be more important to boys than girls. In support, Sadker and Sadker (1986) stated that confidence of females are low such that their ability to study science subjects like mathematics is practically unconnected with their actual ability.

According to Udeani (2012), school factors like Instructional materials, illustration, examples and applications presented in resources materials are more familiar in general to the experiences and interest of males than to those of females. In collaboration AAUW (1992) recognized the deleterious effects of such omissions on females in science. MacDonald (1985) asserts that talented girls are discouraged from advance science and mathematics courses by guidance counselors who try to convince them that the subjects are difficult and unnecessary for them. Limnus and Steveson (1990) and Baker (1983) independently opined that parents discourage their female from sciences because they believe that males perform better in maths from elementary school and throughout their academic process.

The exclusion of women from participation and high achievement in science education means limited access to jobs in these fields, which are among the fastest

growing and highest paying. Studies have shown that a student's performance in science and mathematics is a strong indicator of later earnings (Crawford and Cribb 2013). In science and mathematics subjects many cognitive and non-cognitive skills necessary for individual and national development such as higher order thinking and problem solving are expected to be taught.

Cromie (1995) posits that gender discrimination is a critical factor facing females' effective participation in every field of science. The discrimination results from combination of built in biases that make them less likely to participate in mathematical, critical and technical profession.

The family plays a vital role in selection of profession, science career requires scientists to devote most of their time to researches striving to solving problems and bringing about new innovation (Fgbasan, 2010) stereotype as a social barrier can influence individuals positively and negatively and in evaluating performance, stereotype threat is one compelling explanation that has hindered women and is a major reason why females remain under represented in science.

Closing the gaps in science is essential for ensuring that women as much as men benefit as citizens and contributors to their societies (Garden et al., 1999). Women should not be limited to be being passive users of science and technology but instead should be active participants and decision making, ensuring that science and technology but instead should be active participants in scientific development, applications and decision making, ensuring that science and technology initiatives are implemented to address the needs and preferences of both sexes (Rathgeber, 2009).

Statement of the problem

Ekpo (2004) and Ithen (2002) observed that though there has been considerable progress in facilitating women access in education lately, there is still gender disparity in performance and completion of science, and technology based programmes. It has been speculated that women shy away from science, mathematics and technology related courses giving rise to the following questions:

1. Do women have greater difficulty entering science and technology courses.
2. What are the challenges that females science and technology graduate face in and out of school.
3. What are the barriers to female pursuit of science related careers?

Purpose of the study

The general purpose of the study is to identify the barriers to effective participation of women in science,

mathematics and technology Education.

Specific purposes

The specific purposes include:

1. To ascertain the roles of the school in the low participation of females in science, mathematics & technology education.
2. To identify the impact of socialization in female participation in SMT education.
3. To ascertain the role of cognitive ability in SMT participation.
4. To identify the ways of improving the participation of women in science, mathematics and technology education for national development.

Research questions

1. To what extent does the school contribute to low participation of women in SMT?
2. To what extent does socialization affect participation of females in SMT.
3. To what extent does cognitive ability affect participation of females in SMT.
4. In what ways can female participation be increased in SMT for sustainable development?

In view of the aforementioned, there is need to investigate the barriers to effective participation of women science, mathematics and technology for sustainable development in Nigeria.

METHODS

The study was carried out in Imo State housing six tertiary institutions namely: Imo State University, Federal University of Technology, Federal Polytechnic Nekede, Alvan Ikoku Federal College of Education, Owerri, Imo State Polytechnic, Federal College of Soil Resources Oforola. The research design used was descriptive survey. The population of the study comprised of all the female science educators and female students in the six tertiary institution.

The simple random sampling technique was adopted and fifty respondents from each school was sampled given a sample size of six hundred science lecturers and students. The instrument used for gathering data was 12 items questionnaire on four Likert scale developed by researchers tagged BAFPSMT:

B = Barrier
A = Affecting
F = Female
P = Participation
S = Science
M = Mathematics
T = Technology

The items were weighted as follows:

Very high extent: 4
High extent: 3
Low extent: 2
Very low extent: 1

The mean of the scale was calculated:

$$X = \frac{4 + 3 + 2 + 1}{4} = \frac{10}{4} = 2.5$$

Any mean rating below 2.5 was rejected and 2.5 & above accepted.

RESULTS

Research question 1: To what extent does the school contribute to low participation of females in SMT education?

Table 1 revealed the role of the school in low participation of females in Science, Mathematics and Technology Education, Instructional procedure used by lecturers female exploitation by male lecturers and academic foundation of female recorded an average mean of 2.36.

Research question 2: To what extent does socialization affect participation of women in SMT education?

Table 2 unveiled the impact of socialization on participation of females in SMT, findings revealed an average of 3.36 indicating that professional gender labeling, peer group influence and family background play a crucial role in participation of females in SMT education.

Research question 3: To what extent does cognitive ability affect participation of females in SMT Education?

Table 3 analyzed the extent to which cognitive ability affects participation of females in SMT education findings revealed that IQ, lack of ingenuity and lack of critical analysis does not affect female participation in SMT education with a mean rating of 1.82.

Research question 4: In what ways can female participation be increased in SMT for sustainable development?

Table 4 results revealed that the use of successful females of SMT education as resource persons, the use of pragmatic approach in the teaching/learning process and the award of scholarship can help to increase female participation in SMT education.

DISCUSSION

Barriers to participation of females in Science,

Table 1. The role of the school in low participation of females in SMT education?

Question item	Total score	Sample size	X
Instructional procedure used by lecturers in schools contribute to low participation of females in SMT education	-1326	600	2.21
Females exploitation by male lecturers in SMT education contribute to low participation of females in SMT	1844	600	3.07
Poor SMT foundation in high school contribute to low participation of females in SMT education	1094	600	1.82
Average mean	-	-	2.36

Table 2. The impact of socialization on participation of females in SMT education.

Question item	Total score	Sample size	X
Professional gender labeling affects participation of females in SMT education	1923	600	3.20
Peer group influence affects participation of females in SMT education	1871	600	3.11
Family background affect participation of females in SMT education	2019	600	3.36
Average mean	-	-	3.22

Table 3. Cognitive ability and participation of females in SMT education.

Question item	Total score	Sample size	X
Females have low intelligence quotient (IQ) and this affect their participation in SMT education	1108	600	1.84
Poor mathematics foundation affects participation of females in SMT	1138	600	1.89
Lack of analytical and spatial skills affects female participation in SMT	1043	600	1.73
Average mean	-	-	1.82

Table 4. Strategies for increasing female participation in SMT education for sustainable development.

Question item	Total score	Sample size	X
Using successful females of SMT education as resource persons during career day in schools will increase participation of females in SMT	2096	600	3.49
Scholarships to females in SMT education will increase participation of females in SMT	1902	600	3.17
A pragmatic approach such as the use of 21st century teaching strategies in the teaching of SMT in schools will increase participation of females in SMT	1094	600	3.03
Average mean	-	-	3.23

Mathematics and Technology Education ranges from professional gender labeling, and peer group influence to family background. Findings revealed in Table 1 that instructional procedure used by lecturers, exploitation and SMT foundation of females was not a determinants on the participation rate of females and this is different with the position of Spears (1985) that attitude and teaching approach of teachers influence the attitude of females.

However, Mac Donald (1985) asserts that talented girls are discouraged from advance science and mathematics

courses by guidance counselors who try to convince them that the subjects are difficult and not necessary for them. Thus, schools play important role in female access to science by the manner in which the curriculum is implemented. Undeani (2012) and AAUW views runs contrary to the results obtained in the present study.

The Nigeria culture, socialization leads to certain personality characteristics regarded as masculine or feminine independent qualities like initiative and assertiveness for boys and dependency, submissiveness and complacency for girls, thus making them believe that

boys are superior, mentally than girls, the findings of this study corroborates the views of Limnus and Stevenson (1990) who pointed out that parents discourage their females from science because they believe that males perform better in mathematics from elementary school and through their academic process.

In the same manner, Holloway (1993) asserts that the family plays a role in the selection of profession especially science career which is believed to be tasking. The present study revealed that in the past formal education was seen as a waste for females, who are eventually married off to become housewives, hence average mean of 3.36 is not surprising because Harding (1987) reported that low performance of females in science, mathematics and education is traceable to the assumption the society makes about males and females.

Participation of females in SMT education is hindered because of the socialization and traditional role assigned to girls right from birth, this culture learned directly or indirectly determines how a person thinks, feels, directs his or her action and determines the outlook on life.

To crown it, Cromie (1995) posits that gender discrimination is a critical factor facing female effective participation in every field of science and this results from the combination of built in biases that reduces their participation in mathematical critical and technical profession. The study revealed that cognitive ability has no effect on participation of females in SMT Education with the mean rating of 1.77 and in support Viadero (2006) pointed out difference in brain structure and maturation rates may account for differential performance in school-related tasks but Erinosh (2008) poits that ability is not a determining factor in performance because males and females are found to perform equally if instructional context is fair and conducive.

In support to the aforementioned comment Marshall and Horton (2011) asserts that in teaching of SMT subjects many cognitive and no cognitive skills necessary for individual development such as high order thinking and problem solving are taught.

Thus, cognitive ability though a vital tool for retention is not a determinant for participation in SMT education. Strategies for increasing female participation had average mean of 3.23 which revealed that the incentives like scholarship, use of pragmatic approach in the teaching/learning process can increase female participation in SMT.

In support, UN (2000) and UNDP (2001) reported that the Beijing conference of 1985 played a key role in integration of women in decision making policy of many countries and their efforts have reduced the gap between males and females in decision making. Furthermore United Nations Department of Economic and Social Affairs (2010) opined that the exclusion of females from generation and application of scientific knowledge represents a tremendous waste of human potentials.

Hence, McCarthy (2003), Ellis (2003) and Kishore (2008) pointed out that participation of women in Science,

Mathematics and Technology Education though low can be remedy because United Nations have realized the crucial role of women in the development of any country as well as understanding the gender differentiated efforts of the development plan which insist that women empowerment and full participation are prerequisites for achievement of equality, development and peace.

Conclusion

The result of the study suggest that instructional procedure, gender labeling and culture are issues in participation of females in SMT education and this calls for continued efforts to enlighten the society on change of attitude to gender roles to enhance the acceptability of females into ventures that are referred to as male dominated profession. A motivating factor for some of the female respondents was the use of females who have excelled in SMT course as role models in SMT areas that are perceived male dominated environment. The study further emphasis the need to publicize and celebrate the successes of females SMT professionals as this will encourage more females to follow their footsteps.

Recommendations

The study recommends that the society should be enlighten on the need to change attitude to gender roles, and the need to initiate affirmative actions for females in SMT education. In the same view, females should be assertive and standing for their right avoid unnecessary marginalization, and the school and the curriculum should be gender responsive.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Examination of test and item statistics from visual and verbal mathematics questions

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The aim of this research is to determine whether students' test performance and approaches to test questions change based on the type of mathematics questions (visual or verbal) administered to them. This research is based on a mixed-design model. The quantitative data are gathered from 297 seventh grade students, attending seven different middle schools in Cankaya, Ankara. Of all the students who participated in the research, qualitative data were gathered from 10 of them. In this research, seventh grade mathematics achievement test was developed by the researchers in visual and verbal forms. 10 of the students were selected and interviewed by utilizing semi-structured interview form. From the findings of the study, there was significant difference between the test scores and response time of the two forms in favor of visual form. The difference between item statistics is changeable in terms of the function of the visual. The results of the interviews showed that students have positive views toward visual questions. The students' perceptions of the use of visual in mathematics questions are examined in three main categories: preferability, comprehensiveness and responsibility of the questions.

Key words: Visual, item difficulty, item discrimination, students' perceptions.

INTRODUCTION

Today, information is transferred through different forms and visual stimuli. Visual is commonly utilized in different areas including marketing and education, and is defined differently based on field of utilization. Generally visual can be defined as the stimulus related to sight (Turkish Language Institutions (2016).

In the literature, visuals have been defined as vehicles of concretizing the mental representation of any concepts (Sharma, 1985; Beb-Chaim et al., 1989).

More specifically, some researchers define visuals as a form of geometry used for stating mathematical concepts

(Habre, 2001; Zaraycki, 2004). In education, visual aids are utilized in many print education materials. In educational fields, visuals are defined as means (like symbols, graphics or photograph) of transforming information in other ways other than verbal forms (Lanzig and Stanchev, 1994).

Visuals are used in written instructional documents for many purposes. The functions of visuals in materials are classified in different ways. One of the most extensive classifications of the function of visuals in instructional documents was developed by Clark and Lyons (2004).

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Visuals are placed in written instructional documents mainly for two purposes:

1. Communicational and
2. Emotional.

Communicative functions generally focus on how information is transferred. With this approach, visuals are used in instructional documents for decorative purposes. They therefore add a sense of aesthetic and humor to the documents, making them more attractive.

Visuals used in measurement instruments, especially in reading comprehension tests, are similar to the ones used in other instructional documents in making them more attractive although they are not directly related to the content of the test item (Levin, 1981).

This usage is sometimes recommended for instructional activities but not for measurement instruments. Visuals are used to make specific place, object or person described in the test item more concrete and real for readers (Levin, 1981).

For transformative purposes, visuals are utilized to describe the process. To highlight changes with respect to time and place, the steps of the process are reflected by visuals. Due to this usage, congruent events could be ordered with fewer words (Yuill and Oakhill, 1997).

Both usages, related to interpretational purposes, help the reader to understand the text. Therefore, it is necessary to state some situations in a more comprehensible way and briefly (Peeck, 1993). Similarly, the basic purpose of integrating visuals in the tests items is to state complex stations verbally with less words or even without using words (Furst, 1958).

Visuals thus make complex test statements more simple and comprehensive (Peeck, 1993). In test items with scientific content, visuals may be more informative than words (Stewart et al., 1979; Crisp and Sweiry, 2003). By representing the same content with appropriate visuals, fewer words may also prevent wrong answers because visuals may reduce the difficulty in reading comprehension and contribute to item validity (Shorrocks-Taylor and Hangravesgen, 1999). Especially for students with low reading comprehension ability, using visual in test items may help to compensate for this problem (Kopriva, 2008).

Another form of visuals used for communicative purposes is mnemonic. Students can easily recall information gained in the text with visuals (Nickerson, 1965; Standing, 1973; Diamond, 2008). Similarly, visuals in the test items are effective in recalling information to answer the test item (Peeck, 1974). For the communicative purposes, visuals serve as organizers. This function provides an arrangement of the information given in the test item within the appropriate structure (Levin, 1981). The qualitative relationships between contents can be projected through visuals such as trees, charts and concept maps (Clark and Lyons, 2004). These

kinds of usage are frequently encountered in science questions.

Visuals in educational materials have psychological as well as communicative functions. In line with this, visual factors primarily help individuals to focus on educational materials, and also motivate them (Sweiry et al., 2002; Clark and Lyon, 2004).

Handono (1996) argues that visual materials with texts are more effective in making abstract thoughts more concrete. Specifically in math questions, visuals motivate individuals and help them to concentrate (Murphy, 2009a). Hence, tests are recommended to include symbols that motivate students (Salend, 2009). However, there are some other researches with reverse findings. 15% of the studies focused on this issue conclude that visual materials do not have a positive influence on students' motivation (Levie and Lentz, 1982).

Visuals are utilized to make the situations in test items as close as possible to the daily life (Berberoğlu, 2012; Saß et al., 2012). This usage is one of the basic purposes of visuals in the test items (Murphy, 2009a). Visuals not only make the information in the test items more meaningful for the students but also provide an opportunity to evaluate the utility of knowledge in daily life. Based on this function of visuals, the aim is to increase its availability in the math subtests of the Programme for International Student Assessment (PISA) (Tout and Spithill, 2015).

Therefore, visuals can be incentive for students with low achievement level by making the information more meaningful (Kopriva, 2008). Therefore, they also respond to psychological functions indirectly. However, designing test items to reflect everyday life may lead to misunderstanding of the question (Ahmed and Pollitt, 2007), and it may have a negative effect on performance. In order to prevent this kind of performance decrease, the focus of mathematics questions should be mathematical content rather than everyday life relation (Brown, 1999).

Beyond psychological and communicational functions, visuals may be effective for the students' cognitive processes. Mathematicians and scientists have a consensus on the idea that visuals play a central role in cognitive processes (Phillips et al., 2010). Although the models examining the effects of visuals predominantly try to explain learning situations, theoretical assumptions make these models relevant for test situations as well (Sternberg, 1999c).

Every assessment is based on a theory or an understanding regarding how people learn, what people know and how knowledge develops over time (National Research Council, 2001). Thus, cognitive learning models are important for designing items in developing tests and important pieces of the framework used to reach conclusions about answerers depending on their test item performance (National Research Council, 2001).

In other words, cognitive theories can be used to determine the characteristics of items in the answering

process (Whitely, 1983; Haladyna et al., 2002). Based on cognitive learning theories, it can be said that mental operations during the learning and assessment have some similarities and differences (Saß et al., 2012). Therefore, one of the theories used to explain how visuals influence answerers' performance is "dual coding theory". The theory developed by Paivio (1990) explains how to learn the information coming from two different sources.

According to the theory, information can be confronted in two ways, visual and verbal. Verbal information is expressed by words whereas visual information is expressed by non-verbal forms such as picture and voice. Moreover, two different types of information are recorded as two different codes in the cognitive system through the affective memory (Paivio, 1990).

These two systems are related in terms of being convertible to each other, although they are completely independent in the area of functions and structures of verbal and visual operation process (Vekiri, 2002). In other words, visual codes have a verbal response inside the brain; meanwhile verbal codes have a visual response.

Consequently, PAVIO (2013) emphasizes that visuals are used to organize information. Additionally, only verbal stimuli have less influence on activation of non-verbal memory therefore they are less remembered (Lohr, 2003). In contrast, giving visual and verbal information together provides connection while coding.

Eventually, learning is more permanent when both systems are included (Paivio, 2013; Shepard, 1967; Sweller, 2010). The mental process of visual elements in a learning procedure is similar to the process of visual elements in an assessment procedure; therefore, based on this similarity, Ahmed and Pollit (1999) developed a response model.

According to this model, individuals interpret the elements of an item over two different systems when they confront a test item with visual elements. First, individuals make mental representation, and then examine this representation whether it matches with existing information and finally makes a comparison between these two situations (Pollitt and Ahmed, 1999). These phases are named; reading, examining and matching respectively. Answerers have no control over this process (Ahmed and Pollitt, 2007); as a result, the elements of an item can differentiate the mental representation of an individual from his/her test performance.

Physical characteristics of a test can be determinant of increasing true answer possibility within the test items including both verbal and visual information. In addition, Carpenter et al. (1990) argue that one of the three factors which are effective in predicting item difficulty is to make abstract connections between variables of the item. In order to relate these variables, the information presented from different sources such as verbal and visual should be ascribed a meaning and interpreted by supporting

each other. Hence, the concern is the mental process of responding while developing test items, and so potential statistical reflection of this design would be beneficial. There are some points to be concerned about due to positive reflections.

Due to the positive effect of answering performance, visual components should be salient for students and need less mental operation to ascribe meaning; that is to say answerers can execute operations automatically (Vekiri, 2002). For this, visual components should be as clear as possible. To ascribe meaning to visual information including irrelevant information to the stem of an item or repeating the information existing in the stem, needs more mental steps, therefore it may obstruct the real performance of answerers. Additionally, irrelevant interactions emerge from divided attention of answerers into various information sources on account of non-central information components (Berends and Lieshout, 2009).

Individuals are obligated to interpret more than one source in order to ascribe information, and consequently their attention is splitted. For instance, an image with its description in the stem of an item leads to the same effect, and this situation requires more mental operations. According to Ahmed and Pollit (2000) model, irrelevant details and contents cause activation of wrong concepts, and they can orient to wrong answers specifically in the stressful atmosphere of the exam.

Moreover, simplicity is a desired feature of a test in respect to the multi-choice test item writing guide identified by Haladyna (1989). Clear questions prevent distraction. The basic approach in simplicity is to allow visual components only when they support understanding of the question and help in the answers (Filippatou and Pumfrey, 1996; Crisp and Sweiry, 2003; Kopriva, 2008; Haladyna and Rodriguez, 2013). Thus, each visual component of an item must have a function for the question (Crisp and Sweiry, 2003). Kopriva (2008) states that unnecessary or non-supportive information should not be given in the visual component of an item.

A research by Rasmussen and Bisanz (2005), conducted with elementary and kindergarten students, has revealed that answerers have difficulty in ignoring irrelevant information and this leads to decrease in their performance especially mathematics performance.

Similarly, Berends and Van Lieshout (2009) argue that giving room to repeated and irrelevant information in the item content is not appropriate for exams which examine arithmetic skills. Accordingly, students who do not become automatic in operational skills should struggle more to calculate to get answer. Another way to prevent divided attention is to place related information sources as close as possible to each other (Sweller, 1994). Placing visual and verbal information sources away from each other may have negative effect on the respondents' performance.

Another point to be noticed is that test items should be

written by considering respondents' close and distant environment, and situations they are familiar with or probably they will be familiar with (Demirtaşlı, 2010). A question not understood by individuals may lead to various biases (Schiffman, 1995; Shriver, 1997; Anagnostopoulou et al., 2015).

Similarly, in the framework they developed for the right usage of visual element in a test item, (Salona-Flores and Wang (2011) emphasize that the visual component of the test item should belong to the respondents' culture. They forecast that if respondents have no idea about the topic their motivation decreases. This situation can be applied to the test item which has a visual component. In a study conducted by Ahmed and Pollitt (2000), answerers stated that they left the question blank because they had not seen the bridge in the visual before, so thought they could not have replied.

To have consistency of all the visual components within the scope of the test is another point to be considered (Haladyna et al, 2013). Accordingly, all visuals given in a test should have the same size and format. Aforementioned, consistency enables the test to be simplified (Osterlind, 1989). There are various suggestions in the literature for the type of visual components which will be placed in the test scope. Salona-Flores and Wang (2011) emphasize that visual should be a drawing rather than a picture or caricature. It should be a simplified representation of a real ingredient. Real pictures may take respondents' attention away from the important information of the text; therefore, to ascribe meaning and study on diagrams may take long time. As for caricatures, some findings reveal that caricatures take respondents away from the direction of scientific thinking (Mevarich and Stern, 1997). Hence, respondents try to solve the question- specifically designed with everyday life content- by using everyday life information with less abstract thinking. In line with this, a study by Ahmed and Pollitt (2000) indicates that respondents reported that the fish caricature within a biology question took them away from reality.

While writing test items in a visual-including way, to consider all these points argued under the title of formal features of a measuring instrument does not ensure item function to be executed. Accuracy of measurements can be possible when the instrument performs its function properly. This is crucial particularly for appropriate decisions that are made on the basis of this information. Thus, the features of test items should be considered carefully to obtain practical, meaningful and applicable information from measurements. The features of a test item are handled with various aspects such as relatedness, balance, competence, objectivity, specificity, difficulty, discrimination, reliability and response speed (Ebel, 1965). Two basic approaches can be assessed empirically and judicially (Wiggins, 1998).

One of the methods used to identify the qualification of test items is empiric approach. Empirical evidence is

collected by test and item statistics. Anastasi (1982) states that there are features of a test item on the basis of these collected qualitative and quantitative values. Hence, formal features of an item including visuals can influence respondents' performance, and so test and item statistics can be influenced. The basic purpose of item analyses is to ensure that developed instrument consists of items which have desired features and to be informed about respondent groups on the item level (Erkuş 2003). Item statistics are not only used in developing studies but also in determining item biases (Nitko, 2004).

Item discrimination is one of the statistics that is calculated to investigate the qualification of a measuring instrument. Item discrimination is the power used to distinguish individuals who have high and low performance in the feature measured (Crocker and Algina, 1986).

In other words, item discrimination is also referred to as item validity in terms of demonstrating the degree of expediency of the item. According to Hillocks (2002), the basic problem with tests is whether it fulfills the function aimed by the test developer or not. In this sense, only a well-qualified multi-choice question is answered correctly by respondents who have high scores in total; is answered wrong by answerers who have low scores in total. Another feature providing information about item qualification is item difficulty. In the most practical sense, item difficulty is the correct response rate in the group it is applied (Crocker and Algina, 1986). This value gives information about difficulty of a question therefore it is described as easy when majority of the group answer correctly.

Various studies are conducted in order to identify the effects of visual ingredients on test and item statistics. Thinsley and Davis (1974) concluded that to measure the same achievements, two different test forms can be developed, one of which is completely configured by verbal items whereas the other one is configured by using visuals. On the basis of this conclusion, two different forms of the same item (one of them is to include visuals and the other is only verbal) are prepared and differentiation of item statistics is examined in both forms. In this frame, Washington and Godfrey (1974) and De Melo (1980) applied air force special ability test and biology test respectively; as a result they found that visual questions are more advantageous than non-visuals. Similar studies conducted in Turkey through geometry, physics and science questions revealed that test statistics do not differ by the addition of visual elements (Kaptan, 1985; Bağcı, 1998; Civelek, 1998; Duran and Balta, 2014).

In addition, judicial approaches are beneficial to determine the qualification of the test developed. For this purpose, not only the experts on the issue but also respondents are referred to when evaluating the test item. The test item can be asserted that it fulfills the aim properly identified by developers when their expectations

and answerer's responses are overlapping. In other words, if a student achieves expected mental processes while answering the question, relevant measurement can be made (Ahmed and Pollitt, 2000).

To identify this, students' views are taken. It is aimed to determine what they think and how they approach the item when they encounter a question. From these expressions, it is tried to detect if developers' expectations and answerers' mental processes are overlapping. Respondents primarily expect a test item not to be confusing (Popham, 2000).

It is emphasized in the literature that test developers attach importance to test items to be pure in order for respondents to deliver real performance. Therefore, developers and respondents' stylistic expectations from a test item are overlapping at the point that a test item needs to be pure as possible. Additionally, visual ingredients can be described as one of the stylistic features, therefore, predicted to be determinant of item functionality.

In the studies that aim to determine the impact of visual elements on item statistics, various tests developed for achievements of different courses are utilized. Those studies conclude that a general framework contribute to the visual ingredients to achieve tests of different courses. According to those findings, there are some domain specific situations in using visual ingredients. It is valid for specifically mathematics test items as well. Students frequently perceive mathematics problems as visual sets and use mathematics models to solve them (Murphy, 2009a).

Understanding abstract mathematics concepts is related to the ability of seeing how these concepts function. Hence, students naturally utilize visual models while solving a mathematics problem (Murphy, 2009b). İşler (2003) states that visuals in education materials can increase the level of understanding of verbal idea, and can take part in the focus of discussion in problem solving process. Cognitive psychological theories also support the impact of visuals on answering questions. Although some studies focus on the relationship between visualization and problem solving skills, there are few researches examining the influence of visuals on the psychometric value of tests.

Respondents tend to solve mathematics problems by using the way they are familiar with (Luchins, 1942). This situation can prevent individuals to head for different solutions (Antoinetti, 1991) whereas visual ingredients can help respondents to use diverse solutions. Moreover, according to Gestalt approach, respondents rearrange problems progressively in their mind (Wertheimer, 1960). This process keeps respondents away from thinking about the item factors separately. Presenting verbal information as a serial can prevent respondents from using holistic approach while visuals can submit a holistic framework in line with information process (Kaufmann, 1985).

The necessity of using visuals in math questions can be based on various grounds in both national and international literature. Whether miscellaneous target behaviors described in National Council of Teachers of Mathematics (NCTM) standards are achieved can be examined more effectively through questions with visual components. Those target behaviors include daily life reasoning skills and representation of mathematical ideas in diverse ways such as tables, pictures and graphics (NCTM, 1999).

Similarly, visual elements are often utilized in the pen-paper exams made for the assessment of the target of cultivating individuals who can transfer the math to daily life and who can share his mathematical ideas, emphasized in the vision of The Ministry of National Education middle school teaching program. The relevant part of the vision takes place in the program with the expression "to cultivate individuals who can use mathematics in daily life, solve problems, and share his ideas and solutions".

Moreover, it can be asserted that mathematics questions containing visual ingredients are specifically functional in order to examine the target behaviors described as "to be able to use mathematical model, to match models with verbal and mathematical expressions" in general aims of The Ministry of Education program (2009). This type of usage enables mathematics, which is accepted as having an independent language within the program, to be enriched with visual ingredients.

In line with the functional purposes mentioned earlier, visual components take place in both large scope tests and teacher made tests. Visual elements are frequently utilized in the test items developed for particularly examining the ability of transferring mathematics information given at school to daily life. In this sense, one of the leading international exams Program for International Student Assessment (PISA) often uses visual elements in mathematics questions. Visuals within the scope of PISA are utilized in order to make the question more remarkable.

Visual elements are integrated into the national exam whose scores are utilised for the decision of transition from middle to high schools in Turkey. Although this exam is named differently from time to time, it is applied every year regularly. For example, OKS (middle education institutions exam) was implemented on only eighth grade students until 2008 where it was left to SBS (placement test) which was applied to sixth, seventh and eighth grade students.

Changes in that exam are not only limited by changing its name but also including some differentiations in designing questions such as creating the questions within everyday life framework and utilizing visual elements in those questions (Berberoğlu, 2012). The exam name was transition from primary school to middle school (TEOG) with the latest regulations made in 2013. TEOG is done two times in an academic year, one is at the end of the

autumn and the other is at the end of spring term, which was done by only the senior students. It is observed in TEOG questions that usage of visual elements proceeds in terms of everyday life.

Approximately, half of the mathematics questions of the tests done for transition to high school in Turkey between 2010 to 2015 years contained visual elements. The same approach is common in middle school mathematics textbooks and teacher made tests. However, there is no research in the relevant literature that aims to identify differentiation in students' performance on verbal or visual mathematics questions and in students' approaches towards questions.

Thus, whether visual elements serve the purposes in mathematics questions, how test and item statistics differs based on visual or verbal expression of the question and students' views and approaches regarding the visual questions are unknown.

Consequently, to compare the students' performance on visually and verbally expressed mathematics questions is seen as a requirement. According to this requirement, the aim of this study is to identify whether there is a relation between visual elements in mathematics questions with test and item statistics, and students' approaches. In line with this general aim, the following questions will be answered:

1. Is there statistically significant difference between items difficulties of correspondent items in visual and verbal forms?
2. Is there statistically significant difference between items discrimination of correspondent items in visual and verbal forms?
3. Is there statistically significant difference between test reliability obtained from verbal or visual questions?
4. Is there statistically significant difference between mean scores of visual and verbal forms?
5. Is there statistically significant difference between response times of visual and verbal forms?
6. What are students' views about correlation between visual ingredients and individuals' approaches towards questions and test performance?

METHODOLOGY

In the scope of the study, first the data obtained from implementation of achievement test were collected. Then qualitative data were collected through interviews with the respondents, and finally the results of two operations were interpreted together. Fraenkel et al. (2011) described this method as explanatory mixed research. As stated in explanatory mixed studies, the researcher made a quantitative study; however, additional information was required to flesh out the results. Thus, the researcher refined and did a follow up of the quantitative findings by using the qualitative method. With the qualitative findings, the results of the quantitative phase of the study became deeper (Creswell and Clark, 2007).

Participants

The study was conducted with middle school students from Ankara,

Çankaya. The study group in the research was selected through convenience sampling. Convenience sampling is defined by Fraenkel et al. (2011) as "a group of individuals who are available for a study." The study group is composed of 292 seventh grade students from 10 middle schools in the spring term of the academic year of 2015 to 2016. All the participants took one form of the mathematics achievement tests which were constructed by the researcher. After the test, 10 students were selected for the interview based on the teachers' guidance. As suggested in the literature, the number of participants was determined by "saturation rule". According to the saturation rule, when there are no new data and themes, it is not possible to replicate the study, for the data are saturated and the data collection process is finished (Guest et al., 2006). Based on this approach, when the students' statements become similar, it was then concluded that the interviews conducted were completed. Since the statements became similar and they do not provide any new data after the 10th student, the interviews had to be stopped.

Data collection tools

Quantitative data are collected through the instrument developed by the researcher. Seventh Grade Mathematics Achievement Test is constructed in two different forms as verbal and visual. The researcher developed the tool in accordance with the objectives described in the seventh grade mathematics instructional program. In order to determine the difference between students' performance in visual and verbal tests, correspondent questions measuring the same objectives were designed in both forms. The content of question in the visual questions is explained through picture, graphic and photos whereas in the verbal questions it is described through words. Due to equivalence of these two forms, experts and respondents' recommendations and feedbacks are considered, consequently required regulations are made. While constructing the measurement tool, visuals are noted to serve a particular function described in the literature (Clark and Lyons, 2004). Therefore, the visuals in the measurement tool have four basic functions. The questions in the achievement tests are divided into four groups by the researcher:

1. Regulator (visuals aim to regulate the data given in the problem in order for data process); 4, 5, 6
2. Informative (visuals that describe the stages of the process given in the problem); 10, 11
3. Descriptive (visuals that describe the situation given in the problem); 1, 2, 3, 7, 8, 14
4. Demonstrative (visuals including mathematical models); 9, 12, 15

A number of experts' views are referred to on account of content validity of the instruments including visuals to fulfill those four functions. In order to eliminate the threat for internal validity, all teachers and experts are requested to examine:

1. Whether the questions are equivalent in terms of meaning (does the verbal-only item have the same meaning with the visual form of it)?
2. In terms of the functionality of visuals, does the visual contribute to the answers or their understanding?

Additionally:

1. Two mathematics teachers in middle school examine the test questions to find out whether they are appropriate for children's reading comprehension level, existing knowledge, and assessment tools to which the students are familiar with.
2. Six measurement and evaluation experts examined the test

forms to find out whether distracters work, the problem expression is clear and it is overlapping with the features in the indicator table

3. Two mathematics education experts examined the questions to understand if there is any scientific error in it.

After making required regulations, the latest form of the test consisted of 19 constructed questions. Pilot application was done with 100 seventh grade students. In accordance with the results of the pilot application, three correspondent questions were removed from the test because they did not work. Moreover, in line with students' views, the expressions of three questions were changed. As a result of this pilot practice, the final form with 15 questions was constituted.

Semi-structured interview forms were utilized for qualitative data collection. In semi-structured interviews, questions are prepared before interview; however, they are detailed with questions asked during interview (Finn et al., 2000).

Semi-structured interviews have some advantages such as easy analysis, allow participants to express their own ideas and provide deeper knowledge (Büyüköztürk et al, 2012). The interview form is answered by students who take the test form. The interview form is prepared based on the findings of former studies that determine the difference between students' performances in visual and verbal test questions.

The aim of these interview questions is to identify if individuals have similar approaches to the visual test question as described in the literature, and to also introduce possible new approaches that have not been mentioned in the literature yet. However, questions are conscientiously generated as open-ended form in a non-manipulative way.

Draft interview form was examined by a measurement and evaluation expert, and received feedback; after that, pilot application of the form was done with five seventh grade participants. Consequently, the final form of the interview form was prepared.

Data collection procedure

The data collection procedure was conducted in two steps. In the first step, which is quantitative data collection, 292 seventh grade students from 10 middle schools in Ankara, Çankaya were involved. All the participants take the mathematics achievement test. Before the test session, the participants were informed about the purpose of the study and the approximate response time.

In each class, half of the students apply the verbal form, and the other half applied the visual form of the test. The students were also asked to score their willingness to answer the test on 5 points (1 is the highest score). Moreover, the students reported the time when they finish the test. During data collection process, the researcher realizes that the students who take the verbal form have tendency to drop answering items. More verbal forms are being copied and applied to students to eliminate the potential imbalance between verbal and visual form applications.

In the second step which is the qualitative data collection, 10 students were interviewed. They were selected based on teachers' guidance. In this step, the aim was to provide deeper explanation for the test and item statistics. Interview is a mutual and interactive process during which the predetermined and purposive questions are answered by the participants (Stewart and Cash, 1985).

In semi-structured interview process, the researcher has the flexibility to direct new questions based on the students' answers, and ignores the pre-determined questions. The interviews are conducted as two sessions for two groups with five students in the teachers' room. Each interview session takes one hour. The statements are recorded and reported by the researcher. To make students state their real opinion confidently, it is aimed to provide a comfortable and silent environment.

To increase the validity of the interview, the questions were constructed away from directing the students to certain answers. Before the interview, the students were given the test papers to check and remember the test items and their approaches to the solution. Direct citations were made from the students' statement to increase the reliability of the study.

Analysis of the data

First, the data collected by achievement test was transferred to an electronic form; then Excel program was used to calculate the item statistics. The item difficulty indexes of each question were computed. Then the following equation 1 (the so-called z-test) was used to determine if there was a significant difference between the indicators of the difficulty of the correspondence questions in both tests separately (Akhun, 1991).

$$z = \frac{P_1 - P_2}{\sqrt{PQ\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}} \quad (1)$$

P1: Right answer percentage in the first sample

P2: Right answer percentage of the second sample

P: The weighted percentage of both samples

Q: 100-P

N1: Size of first sample

N2: Size of second sample

In line with another sub-research question, as the normality assumption was satisfied, "point-biserial correlation coefficient" was computed for item discrimination of each question. Then, the following equation 2 was used to transform the Pearson correlation index r into Fisher's transformation Z_r (Akhun, 1991).

$$Z_r = \frac{1}{2} \log_e \frac{1+r}{1-r} \quad (2)$$

Z_r : Transformation of correlation coefficient to Fischer's z Coefficient

r : Correlation coefficient

The significance of the difference between the transformed correlation coefficients was identified by the following equation (3)

$$Z = \frac{Z_{r1} - Z_{r2}}{\sqrt{\frac{1}{n_1-3} + \frac{1}{n_2-3}}} \quad (3)$$

Z : Student's t statistics of the difference between the transformed correlation coefficient

Z_{r1} : Transformed correlation coefficient from first sample

Z_{r2} : Transformed correlation coefficient from second sample

n_1 : Size of first sample

n_2 : Size of second sample

In line with the other sub-research question of the study, the difference between verbal and visual test statistics was investigated. As a result of the t -test, it was decided that there is a significant difference between the mean of the total test scores and the response time of each test form. Moreover, test form reliability

Table 1. Z-test results of the item difficulty indexes from visual and verbal forms.

Item no.	Item difficulty index		z values
	Visual form	Verbal form	
1	0.76	0.54	3.27*
2	0.67	0.63	0.58
3	0.70	0.46	3.09*
4	0.66	0.41	2.98*
5	0.60	0.58	0.26
6	0.53	0.46	0.77
7	0.73	0.70	0.51
8	0.82	0.78	0.93
9	0.82	0.78	0.93
10	0.51	0.31	2.02*
11	0.52	0.32	2.04*
12	0.56	0.52	0.47
13	0.53	0.45	0.88
14	0.54	0.76	-3.27*
15	0.78	0.71	1.32

scores were computed by Cronbach reliability coefficient. Statistically, significant difference between the test reliabilities was tested by Z test after Fisher's Z transformation as stated in equation 3.

Qualitative data obtained by interviews were examined by descriptive analysis. The aim of descriptive analysis is to organize and interpret the findings of the study before presenting it to the reader (Yıldırım and Şimşek, 2008). Since this study aims to constitute a general framework of students' views about visual ingredients in the test items, descriptive analysis was performed. With this aim, voice records and notes taken during interviews were transferred to an electronic form in a computer and then analyzed. Students' answers to the interview questions were read again and again. For the requirement of qualitative data analysis, participants' statements related to the students' test performance and their approach to the test item were corresponded to a code. Then the researcher examined the codes and calls the codes which are related to each other and cluster in scope based on the same concept.

Literature review and the aims of the study were considered while coding. At this point, the validity of the qualitative results is a critical point. In the study, the method of external audit was applied to eliminate the threat to the validity of results (Creswell, 2012).

In this method, an external auditor examines the study for some points such like the appropriateness of categories, and if the inferences are logical etc. (Schwandt and Halpern, 1988). An external auditor, the narrative account becomes credible. As the external auditor documents and reviews a study, the credibility of the study increases (Creswell and Miller, 2000).

In this study, coding the statement by only one researcher may be a threat to the validity of the study. To eliminate this threat, the consistency of results of the analysis is checked by other experts in the measurement and evaluation field. The experts examined the codes and categories to find out whether the codes were placed in the same category.

Therefore, no disagreement exists between the researcher and the external auditor. After reaching an agreement about the codes, the final results were reported. Categories were constituted as a consequence of coding and findings were tabulated under three

main categories.

RESULTS AND DISCUSSION

Quantitative data analysis

Findings about the difference between item difficulties of verbal and visual test questions

Based on the first sub research question, the aim is to identify if there is a significant difference between item difficulty indexes of correspondent questions from both two achievement test forms. For this objective, first item difficulty indexes are calculated for each item. Then, the significance of the values obtained from each item pair is tested. Item difficulty indexes and z-values are presented in Table 1.

Table 1 illustrates that the difficulty indexes of six questions have a significant difference. In general, the difficulty indexes of the items in visual test form are lower; only item 14 had a higher difficulty index. Students' interviews reveal that this situation is related to learning outcome measured by the item. Similarly in item 14, questions 1 and 3 in the visual test form have significantly higher difficulty indexes than verbal form. This could be due to the fact that representing the question in the mind of students is easier with the help of visual element.

However, questions 2, 7 and 8 do not have a significant difference in terms of difficulty indexes. It could be that the use of visuals did not help the students to represent the question in their minds. For questions 10 and 11 consisting of both verbal and visual forms, the difference

Table 2. Z-test results of the item discrimination indexes from visual and verbal forms.

item no.	Item discrimination index				Z
	Visual form		Verbal form		
	r_{bis}	Z_r	r_{bis}	Z_r	
1	0.56	0.63	0.37	0.39	2.04*
2	0.52	0.58	0.37	0.39	1.57
3	0.52	0.45	0.32	0.58	1.07
4	0.54	0.60	0.34	0.35	2.09*
5	0.50	0.55	0.30	0.31	2.00*
6	0.56	0.63	0.53	0.59	0.36
7	0.56	0.63	0.32	0.33	2.51*
8	0.56	0.63	0.42	0.45	1.55
9	0.38	0.40	0.35	0.37	0.29
10	0.50	0.55	0.30	0.31	2.00*
11	0.59	0.68	0.39	0.41	2.22*
12	0.59	0.68	0.57	0.65	0.25
13	0.52	0.58	0.31	0.32	2.13*
14	0.46	0.50	0.48	0.52	-0.21
15	0.56	0.63	0.47	0.51	1.02

between difficulty indexes in favor of visual form may result from the functionality of informative visuals. Such informative visual questions allow students to understand the steps of finding solutions to problems more easily. It is observed that item difficulty indexes of questions 5 and 6 are close to each other. These questions are called regulators in relevant literature, and they enable one to present the data given in the question systematically like a graph. This result demonstrates that there is no difference between the item difficulty indexes of regulator visual or verbal mathematics questions.

Studies in the literature have revealed contradictory findings about the impact of visual usage on item difficulty indexes. Suh and Grant (2014) examined the history questions in National Assessment of Educational Progress (NAEP) exam applied in a particular year through descriptive method. The results of the study indicate that non-visual questions are more difficult than visual questions.

In a test developed by Vorstenbocsch et al. (2013) for the purpose of the heart anatomy course achievements, the impacts of the usage of answer list or visual on item statistics are examined. The study has demonstrated that different kinds of visuals affect item statistics in different level. However, Civelek (1998) does not reveal a significant difference in the study conducted through electrical circuits. Observing no significant difference between item difficulty indexes may be related to using decorative visuals in those questions predominantly. Unlike the literature in this study, to observe a significant difference between verbal and visual forms of some certain functions may be associated with visuals used not only for decorative purpose but also to facilitate the

understanding of the question.

The difference between item discriminations of verbal and visual test questions

In relation with the second sub research question, it is determined whether item discrimination values differentiate two types of the achievement test forms. First, item discrimination indexes are calculated, and then these indexes are transformed to Fisher's Z_r values. Their two values are compared. Item discrimination indexes were obtained from two forms, and Fisher's Z_r values are presented in Table 2.

Acceptable item discrimination value is 0.30 and above (Crocker and Algina, 1986). Table 2 indicates that item discrimination values in visual test are between 0.38 and 0.59, while in verbal test they vary between 0.30 and 0.57. These values are within the critique values described in the literature. Moreover, Table 2 reveals that there is a significant difference between item discrimination indexes in favor of visual test form. It is observed that only question 14 in the verbal test is insignificantly higher.

Furthermore, Table 2 indicates that there is a significant difference between the informative test questions (10 and 11) of the two test forms in terms of item discrimination indexes in favor of visual test. Observing the same situation in the difficulty indexes is a proof that informative visual questions make the item to be more qualified. Also, item discrimination indexes of the first two of questions 4, 5 and 6 (which include regulator visuals) have a significant difference in favor of visual test. Presenting the data given in the stem of question in a

Table 3. T-test results of the difference between reliability of visual and verbal test forms.

Visual form		Verbal form		z value
KR-20	Z _r	KR-20	Z _r	
0.78	1.05	0.72	0.91	1.15

Table 4. T-test results of the difference between total score of visual and verbal test forms.

Variable	N	Mean	t	p
Visual	167	10.14	3.48*	0.00
Verbal	125	8.52		

*p<0.01.

more regular way influences the performance of answerers in a positive manner.

Questions 9, 12 and 15 that include mathematical models in the tests have no significant difference between item discrimination indexes. In order to interpret this situation correctly, answer sheets are examined and it has been observed that students could answer those questions by making the necessary drawings. Moreover, the familiarity of students with using models such as Venn diagram may be the determinant of the item discrimination of these questions. Students can answer the questions they are familiar with without any visuals.

There are various studies that examine the difference between item statistics of verbal and visual test questions. One of those studies was carried out by Civelek (1998) through geometry questions. In the study, there were two separate test forms. One of those tests explains a triangle measure of angles in a figure and the other explains the same content with words. Two types of tests were given to the students. As a consequence, it is observed that there is no significant difference between item discrimination indexes of the tests.

Bağcı (1998) utilized questions prepared for examining the achievements of the topic of electric circuits. Electric circuits are expressed by figures in one of the forms and by words in another form. Results reveal that there is no significant difference of item discrimination indexes between verbal and visual tests. Researchers explain this insignificance with students' ability to make drawings when they need them.

Although the findings of this study are similar with those of Civelek (1998) and Bağcı (1998) study in one aspect, to conclude a general deduction is not possible about the difference in item statistics between visual and non-visual questions. Instead, according to the results of this study, it can be concluded that there are differences in item discrimination indexes between informative and regulative visuals that the interpretation of descriptive and

demonstrative various visuals depends on test type.

The difference between test reliability of verbal and visual test questions

In relation with the third sub research question, KR-20 formula is used to calculate item reliability regarding the results of the application of two different types of test (visual and non-visual test). The reliability of the visual test form is 0.78 whereas verbal test reliability is 0.72. Consequently, it can be stated that the reliability of the verbal test is relatively lower than visual test. The significance of this difference is tested. For this, Fisher's Z transformation is done and the significance of Z_r values is examined. Those values are presented in Table 3. As Table 3 illustrates, there is no significant difference between verbal and visual test form in item reliability. This finding is consistent with other studies in the literature. For example, Civelek (1993) and Bağcı (1998) also found that there is no significant difference in the reliability of the two tests done.

The difference between mean scores of verbal and visual test

T-test is performed in line with the second sub research question in order to observe if test scores means differ based on test forms. The results of t-test are presented in Table 4. The means of visual test scores are significantly higher than the means of verbal test scores. The studies in relation with this purpose reveal contradictory results in the literature. For example, Washington and Godfrey (1974) examined the visual questions of American Air Force Specialty Exam; De Melo (1980) examined the visual questions of biology test: both studies indicated that visual questions are more advantageous than non-visuals. Moreover, Duran and Balta (2014) conducted a study through SBS science questions, and concluded that the mean of the visual test scores is significantly higher than the mean of the verbal test scores. Accordingly, the number of questions left blank in the verbal form is higher than that in the visual form. Hall et al. (1997) state that students have higher performance in visual test forms because visual components make scientific contents to be more understandable.

The difference between response time of verbal and visual test

Depending on the second sub research question, t-test is performed to understand if response times differ significantly according to the test forms. The results are shown in Table 5. Table 5 demonstrates that the difference between answer times of students is significant

Table 5. T-test results of the difference between total response time in visual and verbal test forms.

Variable	n	Mean	t	p
Visual	167	28.89	5.28*	0.00
Verbal	125	36.68		

*p<0.01.

in favor of visual form. This result is consistent with the literature. Saß et al. (2012) which asserts that test questions consisting only of visual elements in the stem lead to different answers. From this finding, the results of the interviews with students are determinant.

The analysis of qualitative data

To present the students' expressions, those who answered the verbal form questions are notated as "verbal" while those who answer the visual form questions are notated as "visual" in the following part of the report.

Students' views about the difference in preference to answering verbal or visual mathematics questions

In order to determine the level of willingness of students to answer the questions during the test, they are requested to rate their willingness between 1 to 5 (1 is the lowest and 5 is the highest). The mean of the ratings of visual test answers is 3.9 while the mean of the ratings of verbal test answers is 3.0.

Although, this finding cannot be interpreted properly as there is a significant difference in willingness in favor of visual test answers as this test may be influenced by a number of factors, visual test answerers can be stated as more willing to answer. In support of this situation, a study by Peeck (1993) emphasized that educational materials containing visuals increase the willingness of students to answer questions. Table 6 contains the codes related to preferableness of visual questions.

Nine respondents state that individuals answering visual test form are more advantageous. Visuals in test questions create an impression on nine answers as they are easier. All respondents specify that visual test questions can be described shorter and in parallel with this, they can be answered in a shorter time. Additionally, nine students conceive that answering visual questions is more practical.

Most of the respondents expressed that they think visual test is easier. Thus, respondents are more willing to solve visual test problems and therefore the probability of giving correct answer increases. The willingness of students to answer questions, and the persistence of students to think in a detailed way in order to answer the question instead of superficial thinking increase the

probability of giving correct answer (Whimley and Lochhead, 1999). Accordingly, Shepard (1967) stated that visuals included in problems have more positive impact than words and increase the students' willingness to answer. Abedi et al. (2003) also conceive that visual components make questions easier for respondents. In support of these opinions aforementioned, students who think that visual questions are easier to answer make more effort to answer. Hence, it can be said that there are differences in the answering behaviors of visual and verbal test forms. Only one respondent specifically stated that he does not prefer to answer visual test form. According to this respondent, asking the same content using visuals or words does not differentiate the difficulty of the question.

Verbal 1: There was no visual in my test but everything about the question was described. The same questions are given to my friends with visuals in the other test. Eventually, both two tests requested for the same thing but the question was longer in mine whereas it was shorter in theirs. Therefore, both of them are equally difficult.

Students' views about the difference in comprehensibility of items between verbal and visual questions

Eight respondents who prefer to answer the visual test form express that those kinds of questions are more understandable. Codes related to the category of comprehensibility of the visual questions are presented in Table 7.

Table 7 illustrates that six respondents think that visual questions are more understandable because those visuals make it easy to represent the problem in the mind. Similarly, four respondents conceive visual questions are more understandable because they do not need to execute logical reasoning to understand the questions. Some respondents provided the following reasons:

Visual 5: I understand more easily with a picture. Sometimes I can even solve the problem without reading the whole question by just looking at the picture. I do not bother reading the questions. I do not want to read the question if it is long. I do not answer those long questions in other exams just because I am too lazy to read.

Visual 3: I am bored reading the question when it is long. In fact, I take notes to summarize the question and understand better. But the question can be expressed shortly when it contains visual.

Verbal 2: The visual presence in the question definitely makes me to understand. There was no visual in the test I answered, therefore, I had difficulty representing it in my mind. Hence, I think the visual test respondents are more

Table 6. The codes related to the category of “preferableness of visual questions”.

Code	Frequency
Visual test form is easier	9
Questions in visual form are shorter	10
Solutions of those question in visual form are more practical	9
Replying time is shorter in visual form	10
It is easier to understand the visual form is easier	8
The reasons of those who do not prefer visual form	The number of individuals gave a reason
The same content expressed differently in both test forms	1

Table 7. Codes related to the category of “comprehensibility of the visual questions”.

Code	Frequency
It reduces the burden of reading	10
It makes it easy to represent in the mind	6
We do not have to execute logic to understand the question	4
Trying to understand the picture is easier than understanding the sentences in the question	8

advantageous.

Verbal 3: I feel bored reading the question when it is long. I did not read the questions in this test because the questions are long. The questions are shorter with a picture, and it makes it easier to read. Eight respondents mentioned that trying to understand pictures is easier than trying to understand words. Therefore, they mentioned visuals in questions make them more understandable. Those expressions of the respondents reveal the students have tendencies to be bored of reading.

Thus, opinions about shorter questions are preferable and more understandable by means of containing visuals illustrate similarities. Respondents stated that they could reach all information they need for solution by just looking at the visual. This situation mentioned by students takes part in the literature as “mistake in reading” which is one of the error sources in problem solving process (Whimley and Lochhead, 1999).

According to this, error sources which respondents encounter at the stage of understanding the question are put in the following order: reading the question without focusing enough, skipping some words while reading or not being able to focus on the meaning while trying to read fast because of not paying enough attention. The students’ expressions support these as well. Although respondents do not feel entitled, they state that they prefer to interpret visuals rather than words as visual questions reduce the burden of reading by reducing the number of words located in the stem of the question.

The respondents of the visual test were asked if they prefer to visualize differently any one of the visual questions in order to determine whether mental representations and existing visuals are overlapping or not. Students reflect to change only the third question

visual, in addition they express that they need more examples to understand the rules of the pattern. This situation is parallel with the other students’ views who answered verbal test form. Some students’ views about this question are as follows:

Verbal 1: For example, I cannot understand the third question. I looked at the pictures on the class board in order to solve it.

Visual 5: I would draw more pictures for the third question as well; there should be 5 or 6 pictures at least.

As a consequence of the influence of the differentiation in the test item on the test statistics, it is observed that visual form has more acceptable values. It is interpreted as a proof of mental representation, and the test visuals are overlapping that students do not need to visualize the test questions differently. Therefore, it is concluded that visual mathematics questions are more understandable than verbal ones.

Students’ views about the difference in responsiveness of questions expressed visually or verbally

Nine respondents think that the solutions of the visual questions are more practical. Six respondents express making drawings and transactions on the given visual are enough to solve the problem. Table 8 demonstrates the codes related to category of responsiveness of visual questions. Table 8 indicates that all of the respondents say reading and solving the visual problems take less time. Seven respondents reflect that questions can be solved with the information given in the visual while eight

Table 8. Codes related to category of “responsiveness of visual questions”.

Code	Frequency
Questions can be solved with the information given in the visual so there is no need to read the question	7
The questions can be solved by making drawings and transactions on the visual	8
Less time is consumed to understand and solve the problem	10

respondents express that they get the solution by making transactions on the visual. One expression of a respondent regarding the issue is:

Verbal 2: I can answer the question without reading if there is a picture. Everything is already given in the picture for the solution. I make transactions on it and this makes me faster.

Another respondent states that visual questions can prevent possible errors and mistakes as there is no need to make drawings for the solution.

Visual 5: The visual presence in the question makes it definitely more practical. Because we can make mistakes while drawing for solution and so we cannot solve the question. However, when the drawing is given in the question, we can make transactions on it and solve it more easily. Particularly in coordinate plane questions, we can solve the problem without dealing with drawing.

The expressions of students are in parallel with the literature. The mistakes made in visualization of situations and relations described in the question are one of the obstacles that make students not to give correct answer due to “inaccuracy in thinking” (Whimbey et al., 1999). The respondents of this study stated that visuals reduce the possibility of making mistake. All the students accept that they can focus on the visual test more easily.

According to both qualitative and quantitative results, it would be more appropriate to make inferences specific to the functions of visuals instead of concluding a general outcome regarding the differentiation in performance of verbal and visual mathematics questions. Positive expressions of students related with the visual questions and answering the visual questions in a significantly shorter time support the claim that those components make positive contribution to willingness to answer the test.

In detail, using visuals to describe staggered issues expressed in the question stem turns test statistics in favor of visual form as a result of reducing the burden of reading. Accordingly, providing the data given in the question stem in a regulated way by graphs does not increase the correct answer possibility but it has a positive impact on the indexes of item discrimination.

However, it would not be possible to make generalizations for the differences in item statistics of the questions which include words or visuals to figure out the problem situation. As one of the results of the study,

there is no significant difference between the reliability of visual form and verbal test form. However, the students' expressions reveal that they have tendency to prefer the visual form. This is also reflected in the data collection process. More students took the verbal form cancel test application without even reading the question; however, the students who take the visual form generally pay attention till the last question. In order to balance the number of students who respond to the visual and verbal forms, the latter is applied more by students. Therefore, after excluding the missing data related to loss of participants, the number of students who answered each form is balanced. Therefore, it may be concluded that the existence of visual in test item may reduce the error from the instrument and answerer by making the students more willing and less reluctant to answer the test item.

Conclusion

In line with the aim of this study, different approaches of individuals to questions and different item statistics between verbal and visual mathematics questions are examined. In general, item difficulty indexes are found lower in visual questions. The difference between item statistics is changeable in terms of the function of the visual.

In those questions which describe the situation expressed in the question stem, item difficulty indexes and item discrimination indexes differ depending on the content of the problem. However, the difference between item difficulty indexes and item discrimination indexes is significant in those questions, which describe the stages of a process given in the stem by using visuals. In the questions including the visuals such as graphics and table which have regulation functioning, the difference between item difficulty indexes is not significant. In addition, item discrimination indexes are computed higher in visual form questions. This is valid for the mean of the test scores and response time as well. However, there is no significant difference between test reliabilities.

Overall, from the students' expressions, it is concluded that they have more positive attitude towards visual questions, and the visual in question makes them to perceive the questions as easier. Moreover, the respondents approach visual items positively as they reduce the burden of reading. Also, they express that visuals make questions both understandable and speed up response process. They describe visuals as more perceptible due to the fact that they get solution less

logically, visuals reduce the burden of reading and that visuals facilitate mental representation. They also say it is easier to understand visual than words. Finally, the respondents state that visual questions are more answerable on account of being able to solve the problem with only given information in visual, of being able to reach the conclusion by making transactions on the picture 2 and of answering in a shorter time.

The test and item statistics are parallel to the students' expressions. The students tend to prefer visual form. Therefore, their test performance is better in the visual form than the verbal form as can be seen from the significant difference between the test score mean of both forms. There is significant difference in the response time and it is supported by the students' expressions. The students state that the visual questions speed up the understanding and answering process.

Similar to the students' expressions about the easiness of understanding the visual question, there is a significant difference between the item difficulty and item discrimination where the visual describes a process in the items. This is because in such question, the visuals make it easy to concretize the process in the test situation. This is also valid for the visual questions in which the data are organized by tables, graphics etc. As the students do not use effort to organize the data, the item discrimination increases. All in all, to observe a significant difference between verbal and visual forms of some certain functions may be associated with visuals used not only for decorative aims but also to facilitate understanding of questions.

Recommendations

Based on the results of this study, some recommendations can be made for future researchers. The participants of this study were 7th grade students. Another study can be conducted with students from different grade level. Moreover, the learning area can be changed. Mathematics questions are examined in this study; science or social sciences questions can be examined in another study. Another point worth examining in future studies is the differentiation of statistics in terms of the students' achievement level or level of their spatial intelligence. In contrast with the literature, it is concluded that there are differentiations in the performance of students, and in test and item statistics of the visual questions. This issue is explained by effective usage of visuals apart from decorative aims. Therefore, it may be recommended that the operators integrate purposive and age-appropriate visuals into mathematics problems to increase their willingness to answer them.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Primary school pre-service teachers' self-assessed competency level of teaching how to read in Turkey

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Learning to read is an important step for a child's academic and social success. Meaningful and fluent reading skills are linked to children's progress in their thinking and criticizing abilities. The knowledge and skills required for effective reading are initially taught in primary schools. The main responsibility of primary school teachers' is to teach pupils how to read. The purpose of this study is to analyze primary school pre-service teachers' self- assessed competency level of teaching reading. For this purpose, teaching reading contents are analyzed in two dimensions: theoretical background and practice. Results show that pre-service primary school teachers are competent in the theoretical background dimension. In this dimension, the parental involvement activities were found in the lowest competency level. Their competency level was moderate for teaching reading practices dimension. For teaching reading dimension, the use of different teaching methods in one activity was found in the lowest competency level. Besides, the results showed that evaluation skills of pre-service teachers in reading activities need to be supported.

Key words: Reading, teaching reading, literacy skills.

INTRODUCTION

The necessity of acquiring strong literacy skills to live a productive life is increasingly being recognized (Kosnik et al., 2006). Literacy is defined as a fundamental human right and the foundation for lifelong learning. For individuals, families, and societies alike, it is an instrument of empowerment to improve one's health, one's income, and one's relationship with the world (UNESCO, 2006).

Teaching first grade students to read is one of the essential elements of a primary school education program. Learning to read is an important step on a child's route to success (Vaughn et al., 2015; Carbo and

Cole, 1995).

Fluent and meaningful reading skills are related to students' progress in criticizing, discussion, and thinking abilities. In primary schools, first grades to third grades, successful reading is mainly considered as a skill in itself. This skill is expected to be achieved by students. However, reading is a skill that students need to obtain information in the fourth and fifth grades. It has been explained that children learn to read from kindergarten to third grade and after that, they read to learn (Green, 1995). Thus, after students graduate from primary schools, it is crucial that they have high level of reading

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skills to be able to do well in literature, social studies, science, and other subjects.

It is a teacher's role and responsibility to provide and plan an effective reading program that will enable the beginning readers to become skillful readers (MEB, 2005). The challenge is to make available the best learning methods to every student. Strong dedication to the implementation of educational standards requires constant reflection upon the academic performances of all categories of students.

The subject of teaching reading often revisits past issues in search of effective practices to positively impact students' reading abilities. Educational reformation constantly seeks instructional strategies, and practices for better teaching. At this point, the education of teacher candidates is an important subject. Their education is expected to have instructional strategies and practices because they are still in the process of learning. The Ministry of National Education also stresses intensive teacher training to raise the academic success of primary school students.

Knowledge and skills required for effective reading are initially taught in primary schools. The curriculum of the Turkish course states that primary school students should be able to use Turkish effectively, read and comprehend correctly, and think creatively as entrepreneurs of researching and questioning (MEB, 2005). Primary school teachers are required to have all the necessary qualifications in order to educate students to have these abilities. Therefore, teacher education programs need to be structured in a way to provide teacher candidates with knowledge and skills concerning reading (Karadağ, 2015).

New beginners of reading basically read to learn reading. Teachers prepare the students and environment for the upcoming reading activity. Teachers make sure that the students are attending to reading activity. At this stage, children begin to recognize words and comprehend their meaning. They also start reading sentences and they have to understand the meaning as well. At this stage, reading speed becomes an important indicator for successful reading. Students should be able to organize the text, analyze the information and summarize it (Figure 1).

Teachers should also provide an opportunity to elaborate on the activity by provoking the students to draw connection with previous experiences and knowledge as well as drawing conclusion and viewpoints about the recent tasks.

Poor levels of academic literacy are a matter of concern and reading intervention campaigns have been put in place all around the world especially in America and the United Kingdom (Mgqwashu and Makhathini, 2017).

In Turkish education system too, literacy teaching is seen as the obligation to raise the academic achievement (Baştuğ and Demirtaş, 2016; Akyol, 2005). As a part of

this progress, European Qualifications Framework for Lifelong Learning is recognized and established nationally (MEB, 2017).

One of the key competencies of lifelong learning in the framework is communication, using native language. In accordance with the key competencies, Turkish literacy program is updated and different teaching methods were adapted last year. Besides the teaching programs, researchers should focus on how to prepare classroom teachers to work with primary school students who are in the stage of learning reading. It has been proven that students who do not develop age appropriate literacy skills by the end of third grade are at high risk of being failed (Snow and Matthews, 2016).

Pre-service classroom teachers may not be able to help students read effectively because of their inadequate experience level. There is relatively little known information about how pre-service classroom teachers manage reading activities. The purpose of this study is to determine primary school pre-service classroom teachers' self-assessed evaluation of teaching reading in theoretical and practical phases.

MATERIALS AND METHODS

One of the qualitative methods scanning model was used in this research. Screening model is a research approach that aims to describe the past or existing situation as it is (Karasar, 2005). This study aims to describe pre-service classroom teachers' self-assessed competency levels in teaching reading. Data were collected using Teaching Reading Survey (TRS). TRS was developed using a content analysis approach. The steps of content analysis were followed as explained by Bailey (1982) and Yecke (2005):

1. Determining the sampling
2. Developing categories
3. Determining the unit of analysis, and
4. Quantification.

The studies of pre-service teachers' courses and assessment approaches related to teaching reading were analyzed (Akyol, 2005; Güneş, 2014; Nargül, 2006). During this process, guidelines and program achievements of Ministry of National Education regarding teaching reading were listed.

Pre service classroom teacher should be able to achieve dimensions and contents of teaching reading subjects. Studies showed that parental involvement is one of the key factors affecting children's reading performance (Kurtulmuş, 2016; Gilleece, 2015; Peissig, 2002).

Accordingly, parental involvement also was in the Ministry of Education's kindergarten level program achievements (MEB, 2013). Finally, the dimensions were established as 'theoretical background' and 'practice' with six items for each. The dimensions and their items were sent to three specialists and final corrections were made. The finalized form of TRS was applied to 10 pre-service classroom teachers to verify whether there was confusion with the overall meaning of the content. TRS was employed as five-point scale (1-the least confident; 5-the most confident) and was completed.

The participants were 60 senior students from the public university of Aksaray City and 60 senior students from one of the

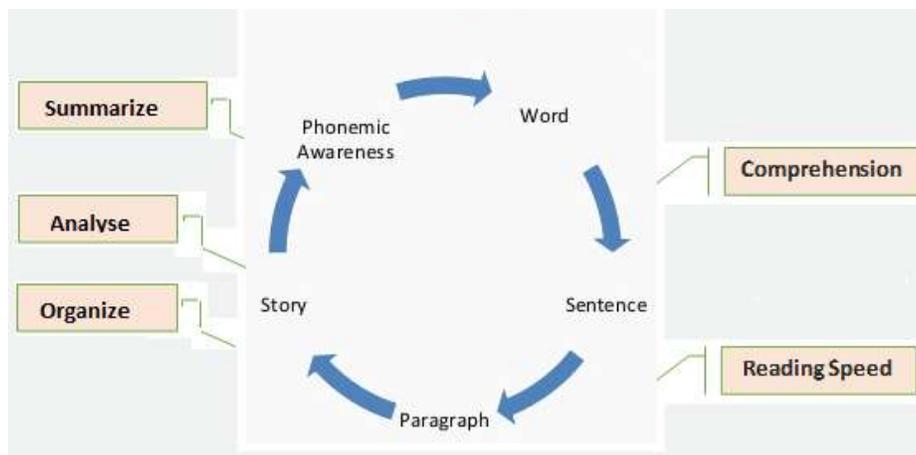


Figure 1. Reading cycle.

public universities of Ankara City. 120 students representing both rural and suburban schools completed the TRS. Before completing the survey, the participants received a cover letter explaining the purpose of the study. The participants worked independently to provide chosen responses and there was no time constraint for the completion of the survey. The arithmetic means and standard deviations of answers were analyzed descriptively using statistical package for social sciences (SPSS) 15.

RESULTS

Primary school pre-service teachers reported their self-assessed competence level of teaching reading. Their responses were analyzed in two sections: The theoretical background of teaching reading and teaching reading practices. Means and standard deviations of theoretical background of teaching reading are presented in Table 1.

Table 1 presents primary school pre-service teachers' self-assessed competence level in teaching reading. Results indicated that pre-service primary school teachers found themselves competent in the theoretical background of teaching reading ($\bar{x}= 3.58$). When we analyze the theoretical background's items, pre-service teachers reported that they were competent in having the *knowledge of different teaching methods* ($\bar{x}= 3.97$), *preparing the child to read* ($\bar{x}= 3.91$), *planning peer tutoring in reading* ($\bar{x}= 3.85$), *reading effects on child's development* ($\bar{x}= 3.77$) and *psychology of children in reading process* ($\bar{x}= 3.57$).

Results show that primary school pre-service teachers had only one moderate level competence in planning *parental involvement activities* ($\bar{x}= 2.45$). Their overall self-assessed competence level in the theoretical aspect was competent. The means and standard deviations of practices for teaching reading are presented in Table 2.

Table 2 presents primary school pre-service teachers' self-assessed competence level in teaching reading practices. The results indicated that pre-service primary

school teachers found themselves moderately competent in teaching reading practices ($\bar{x}= 3.30$). When the theoretical background items were analyzed, pre-service teachers reported that they were competent in *supporting children's word recognition skills* ($\bar{x}= 3.95$). They also reported that they were moderately competent in *evaluating children's fluent reading skills* ($\bar{x}= 3.25$), *supporting children's reading comprehension skills* ($\bar{x}= 3.22$), *evaluating children's reading comprehension skills* ($\bar{x}= 3.15$), *supporting children's fluent reading skills* ($\bar{x}= 3.14$) and *using different reading teaching methods in an activity* ($\bar{x}= 3.12$).

Results show that primary school pre-service teachers had only one competence level in supporting children's word recognition skills ($\bar{x}= 3.95$). For the other items and overall self-assessed competence level, teaching reading dimension was moderately competent.

Results indicated that primary school pre-service teachers' competence level in the dimension of theoretical background was competent while in the section of teaching, reading practices was moderately competent. Results show that pre-service teachers did not feel competent as regards subject in classroom teaching practices.

DISCUSSION

The current study indicated that primary school pre-service teachers were competent in the theoretical knowledge of teaching reading dimension. The moderate level of competence was reported for planning parental involvement activities in this section. Parental involvement in child's education has been accepted as a crucial element. Studies on parental involvement do not only prove their positive effect on child's development, but also present specific links among the structure of the involvement and children's academic achievement and

Table 1. Theoretical background of teaching reading.

Theoretical background	\bar{x}	σ
Knowledge of different teaching methods	3.97	0.36
Preparing the child to read	3.91	0.32
Planning peer tutoring in reading	3.85	0.16
Reading's effects on child development	3.77	0.24
Psychology of children in the reading process	3.57	0.35
Planning parental involvement activities	2.45	0.27
Overall mean	3.58	-

Note: 5-point scale (1=the least confident, 5=the most confident).

Table 2. Practices of teaching reading.

Practice	\bar{x}	σ
Supporting children's word recognition skills	3.95	0.37
Evaluating children's fluent reading skills	3.25	0.32
Supporting children's reading comprehension skills	3.22	0.31
Evaluating children's reading comprehension skills	3.15	0.31
Supporting children's fluent reading skills	3.14	0.30
Using different teaching methods in an activity	3.12	0.30
Overall mean	3.30	-

Note: 5-point scale (1=the least confident, 5=the most confident).

social emotional outcomes (Kurtulmuş, 2016).

Home-school relationship refers to the formal and informal connections between parents and their young children's educational settings. Planning parental involvement for children's reading activities would enhance the reading skills of children. Consequently, knowledge and techniques of planning parental involvement for children's reading activities should be known to primary school pre-service teachers. During pre-service teachers' education, this subject could be more elaborated and practiced. These practices may be directly related to schoolwork, including assisting in reading, responding to children's book choices, and talking about the fiction of the book for comprehension.

The study showed that primary school pre-service teachers had moderate competence level in teaching reading practices dimension. Pre-service teachers state that they are only competent in supporting children's word recognition skills. Comparing with other items in this section, word recognition skills of children are easy to follow and intervene. When the reading skills become non-presentational such as comprehension, pre-service teachers' competence level becomes moderate.

In addition, they reported the lowest moderate level of competence for using different teaching techniques in one activity. Improving the effectiveness of reading practices for the new readers requires different approaches and practices. Informed and effective

classroom instruction, especially in the early grades, can prevent or at least effectively address and limit the severity of reading and writing problems.

Research shows that with appropriate, intensive instruction, all but the most severe reading disabilities can be ameliorated in the early grades and students can get on track toward academic success (Moats et al., 2010). The practices emphasize planning, organization, attention to task, critical thinking, and self-assessed management. Improving primary school pre-service teacher's competency level in using different teaching techniques is essential to enhance the children's reading experiences.

It is important to investigate how each student learns, the processes involved and how learning can be strengthened (Lunt, 1993; Duman, 2017). This investigation involves noticing, representing, and responding to children's literate behaviors, rendering them meaningful assistance for a particular purpose and audience (Johnston and Costello, 2009).

It can be seen that assessment is not only about measuring performance of learners in reading, but also considering how the teaching process is impacting on the children. Primary school pre-service teachers stated that they had moderate level competence in evaluation. It can be suggested that increasing the evaluation skills of pre-service teachers would lead to effective teaching and learning.

The current study provided some preliminary information on the competency level of primary school pre-service teachers, as regards teaching how to read. The results suggested that teacher educators should design practicum periods, which cover all types of intervention strategies for teaching reading. Pre-service primary school teachers are in need of being supported to address the needs of new readers. Further research on effective methods for teaching how to read is also needed.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Student perception on group work and group assignments in classroom teaching: The case of Bule Hora university second year biology students, South Ethiopia: An action research

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Group learning has become a common practice in schools and tertiary institutions. It provides more comfortable and supportive learning environment than solitary work. It fosters critical thinking skills, develops individual accountability, increases levels of reasoning and positive interdependence, improves problem-solving strategies and internalizes content knowledge. But many factors influence the group relation, such as members' perceptions, attitudes and willingness to cooperate and contribute as a team. Therefore, this study was conducted on students' perceptions and attitudes towards the usefulness of group work mainly, and how the students evaluate factors that may affect their participation specifically. This cross-sectional study was conducted in Bule Hora University from February to June, 2015. Quantitative research approaches had been applied; using semi-structured face-to-face interviews and focus group discussion with Biology students and Instructors. Of the total number of 47 students who participated in the study, 25 (53%) of the students' responded that they prefer group work than other types of assessment while few of them 4 (8.51%) replied that they disagree with group work use. The results indicated that students had misconception on objectives of group work and they perceived group work as a means of getting pass mark than seeing it as a means of learning cooperatively through activity.

Key words: Group work, biology, students' perception, Bule Hora, Ethiopia.

INTRODUCTION

Group learning, which is often used interchangeably with collaborative learning, cooperative learning, peer learning, community learning and constructive learning,

has become a common practice in schools and tertiary institutions (Ward and Masgoret, 2004). It is believed to provide a more comfortable and supportive learning

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environment than solitary work (Gupta, 2004; Schofield, 2006). Schofield (2006) explains that group learning fosters critical thinking skills, develops individual accountability, increases levels of reasoning and positive interdependence, improves problem-solving strategies and internalizes content knowledge. In group learning, students are divided into small groups to learn content knowledge, to explore or discuss an assigned topic, or to complete cases, projects and group assignments, to answer a few challenging questions, to exchange ideas, and share some insights with group members (Holter, 1995; Porter, 2006). Porter (2006) indicates that students who work in groups achieve better results, and are more satisfied with their learning experiences than those who do not work in collaborative groups.

It is based on constructivism that emphasizes real talk which includes discourse and exploration, talking and listening, questions, argument, speculation and sharing. Constructivism fosters active learning over passive learning, collaboration over competition, and community over isolation (Cross, 1998; Gross, 1993). The process of group work is harder than working alone as individual because individuals should cooperate with others (Campbell and Li, 2006). A group work requires students to complete work as a group with shared marks. The marks for each individual are determined by the performance of the group. Campbell and Li (2006) say that the aim of group work is to increase students' understanding of teamwork, and to enable them develop skills in coordination, collaboration, contribution, sharing, and dedication. It also benefits students in promoting retention rates, transferring knowledge, providing counseling with cognitive, physical, social, and emotional problems, and enhancing their intercommunication skills (Porter, 2006). But many factors influence the group relation, such as members' perceptions, attitudes and willingness to cooperate and contribute as a team. An important role in the outcome of group work is group member's perceptions and attitudes towards group work. Most students may enjoy group work where they could discuss their academic issues but may dislike it where all members share the same marks regardless of the contribution made by the members. To many participants, this type of practice puts bright and hardworking students at unfair disadvantage and rewards dull and lazy ones, and promotes laziness and irresponsibility at the sacrifice of the efforts of hardworking students (Campbell and Li, 2006).

CSHE (2002) and Burdett (2003) add that, lack of clear objectives, inequality of contribution among group members, unequal distribution of effort, unequal effort not reflected in marks, difficulties of accommodating different work schedules for meeting times, overuse of group work, lack of staff support, the potent effects of assessment, lack of choice and flexibility, difficulty in accommodating cultural and language differences by

students and collaboration are some of the factors that affect using group in classroom teaching. The assumptions behind group work and group assignments are to make learning meaningful through active learning since learners gather information from different sources, and see the relationship among ideas and finally organize and formulate their own ideas. However, the rationale of group work is achieved when group members fully participate in work. In contrary to this, from classroom teaching-learning experiences, researchers believed that their students' participation in group work was usually inadequate. Therefore, this study was conducted on students' perceptions and attitudes towards the usefulness of group work mainly, and how the students evaluate factors that may affect their participation specifically.

MATERIALS AND METHODS

Description of the study area

This study was conducted in Bule Hora University Borena Zone South Ethiopia. Borana zone is one of 13 administrative zones of Oromia state in Ethiopia. It is located in the Southern part of the state (between 3°36' to 6°38' North latitude and 3°43' to 39°30' East longitude) and near border of Kenya. Bule Hora University is found in Bule Hora town 100 km away from Yabello in northern direction 467 km south of Addis Ababa (Lasage et al., 2010).

Study design

Cross-sectional study was used to assess factors affecting the use of group and group activities in class room teaching from February to June, 2015.

Tools of data collection

A qualitative research approach had been applied; using semi-structured face-to-face interviews lasting up to one hour and focus group discussion with instructors from Biology department to triangulate the data obtained from students.

Method of data analysis

Data collected using questionnaires had been analyzed using SPSS version 16.00 and presented in tables, statements and interpreted quantitatively and qualitatively. Data that had been taken from instructors through interview and by making face discussion were interpreted qualitatively and presented in a summarized form.

RESULTS AND DISCUSSION

Analysis of data from students

All forty seven (47) students (100%) replied that group

Table 1. Teachers' implementation of group work in class room teaching.

Question	Alternative	Respondent	Percentage
Did your instructors give you group work or group assignment?	Yes	47	100
	No	0	0
If your answer to number 1 is yes, how many of your instructors use small group in classroom teaching and for outside class works?	Almost all	33	70.21
	Some	12	25.53
	Very few	2	4.26
How frequent do your instructors give you group work or group assignment?	Always	19	40.43
	Sometimes	26	55.32
	Rarely	2	4.26

work is given to them by their instructors of which 70.21% of them said group work is applied by nearly all instructors in class room teaching. However, a few students (25.53%) and very few (4.26%) of them replied as group work is used by some and very few instructors respectively (Table 1). As indicated in Table 1, 40.4% of the students said that their teachers always use group work, and 55.32% of them responded their teachers sometimes use it. Few students (4.26%) said their teachers rarely apply group work. The data in Table 2 indicate that group work is implemented nearly by all instructors but, they did not use it all the time. So, it is possible to say the frequency of group work implementation is fair in average. The students' perception towards learning can be expressed in a range of behaviors, and their values are the basis for their perceptions. Students whose learning perception is positive will try to become more responsible in their learning, and those whose perception is negative will not (Brown, 1994; Wenden, 1991; Wright, 1987). To this end, of the total students who were asked to fill questionnaires 25 (53%) of the students' responded that they prefer group work than other types of assessment which indicates that they strongly agree with group work as means of learning and assessment while few of them 4 (8.51%) replied that they disagree with group work use in class room teaching (Table 2).

Of the total respondents 31 (65.96%) of them reported they strongly agree that group work motivates them to learn from work and 16(34.04%) of them replied they agree that group work motivates them to learn from work. In addition, of the total respondents 31 (65.96%) strongly agree and 15 (31.92%) of them agree that group work develops their independent learning. Of the total respondents 32 (68.09 %) of them said that they strongly agree as group work help them to develop thinking ability and self-esteem respectively. Of the total respondents 29 (61.70%) and 17 (36.17%) of the respondents said group work give them the chance to share ideas with others and they learn better from group interaction than lecture

respectively while 17(36.17%), 15 (31.92%), 7(36.17%), 4(8.51%) replied that they strongly agree, agree, have no opinion, disagree and strongly disagree with idea that they learn better from group interaction than lecture respectively. Highest numbers of the respondents strongly agree that they learn better from group interaction than lecture. This shows that students feel positive about functions of group work. Similarly, Campbell and Li (2006) reported that that Asian students viewed group work positively as place where they can discuss the course related topics and issues, interact and make friends with other students from different cultural and ethnic backgrounds, and develop their problem-solving and interpersonal communication skills, and other skills such as conflict management and resolution, team building, collaboration and sustainability.

Regarding disadvantages of group work, 12 (25.53%), 11 (23.40%), 12(25.53%), 5 (10.64%) and 7 (14.89%) respondents replied that they strongly agree, agree, have no opinion, disagree and strongly disagree with fairness of a group grade, in which highest number 12 (25.53%) replied that group grade is not fair. Respondents give value on perception towards group difficulties such, making them busy, adding burden work on them, difficulties to get together outside their classes, to get references and to share work among members equally. Accordingly, of the total respondents 15 (31.92%) agree that group work make them busy, 17(14.89%) of them responded that they agree as group adds burden work on them. Of the total respondents that had the highest, 13 (27.66%) of them replied as they have no opinion as it is difficult to get together outside class while 16 (34.04%) of them agree with idea that it is difficult to get relevant references for group work. Highest number of respondents (13 (27.66%)) replied strongly agree and agree with the idea of its difficulty to share work equally to members in group work. The student's response show that a number of them feel group grade is not fair, group work adds burden work on them, it makes them busy, and it is difficult to meet outside classes while

Table 2. Students' perceptions on group assignment.

Question	Response										Total	
	SA		A		NO		DA		SDA			
	F	%	F	%	F	%	F	%	F	%	F	%
I prefer group work than other types of assessment	25	53.19	17	36.17	1	2.13	4	8.51	0	00.00	47	100
It motivates me to learn from work	31	65.96	16	34.04	0	0	0	0	0	0	47	100
It develops my independent learning habit	31	65.96	15	31.92	0	0	0	0	1	2	47	100
It helps me develop thinking ability and self-esteem	32	68.09	11	23.40	1	2.13	1	2.13	2	4.26	47	100
It gives me chance to share ideas with others	29	61.70	15	31.92	0	0	1	2.13	2	4.26	47	100
I learn better from group interaction than lecture	17	36.17	15	31.92	7	14.89	4	8.51	4	8.51	47	100
A group grade is not fair	12	25.53	11	23.40	12	25.53	5	10.64	7	15	47	100
Group assignment makes me unnecessary busy	9	19.15	15	31.92	9	19.15	5	10.64	9	19.15	47	100
It adds burden work on me	9	19.15	17	36.17	6	12.77	7	14.89	9	19.15	47	100
It is difficult to get together outside class	9	19.15	8	17.02	13	27.66	8	17.02	9	19.15	47	100
It is difficult to get relevant references	13	27.66	16	34.04	6	12.77	5	10.64	7	14.89	47	100
It is difficult to share members work equally	13	27.66	13	28	9	19.15	7	14.89	5	10.64	47	100

F = Frequency; SA = Strongly Agree; A = Agree; NO = No Opinion; D = Disagree; SDA = Strongly Disagree.

Table 3. Students role in doing group assignment.

Question	Response										Total	
	SA		A		NO		DA		SDA			
	F	%	F	%	F	%	F	%	F	%	F	%
Group members do not respect my opinion	10	21.27	7	14.89	10	21.27	11	23.40	9	19.15	47	100
Some members do not participate	11	23.40	14	29.79	6	12.77	7	1.89	9	19.15	47	100

SA = Strongly Agree; A = Agree; NO = No Opinion; D = Disagree and SDA = Strongly Disagree.

other respondents indicate difficulties of group work in searching for materials and sharing tasks equally. Therefore, these believes of respondents could force them to feel negative about functions of group work.

Tables 3 states students' participation in group work, that is, students respects each other and fairly participation in team work. Of the total respondents, 11 (23.40%) of them strongly disagree with the idea that group members do not

respect each members idea while few 7 (14.89%) of them agree with the idea. Highest number 14 (29.79%) of the respondents agree with the idea that some of their members do not participate in group work and group discussion. Table 4 shows

Table 4. Factors hindering group work.

Statement	Responses										Total	
	5		4		3		2		1		F	%
	F	%	F	%	F	%	F	%	F	%		
Group members do not respect everyone's opinion	13	27.66	8	17.02	4	8.51	7	14.89	15	31.91	47	100
Some members do not participate	16	34.04	6	12.76	9	19.15	11	23.40	5	10.63	47	100
members share roles such as leader, secretary, presenter	4	8.51	1	2.13	8	17.02	20	42.55	14	29.79	47	100
Members share activities that is, collection, evaluation, or organization of evidences from resources	3	6.38	11	23.40	13	27.66	20	42.55	0	0	47	100
Group assignment is done by one student	16	34.04	4	8.51	11	23.40	4	8.51	12	25.53	47	100
Some group members forget to do their share work	18	38.29	9	19.15	10	21.28	2	4.26	8	17.02	47	100
Some members get good grade without doing work	17	36.17	7	14.89	6	12.77	6	12.77	11	23.40	47	100
members do not share works equally	15	31.91	9	19.15	12	25.53	2	4.26	9	19.15	47	100

5 = Always; 4 = Usually; 3 = Sometimes; 2 = Rarely; 1 = Never.

factors hindering group work implementation and how often these factors affect students' participations in group work. Highest number 13(27.66%) of respondents said that group members do not always respect everyone's opinion while few number 4(8.51%) of them replied as group members do not rarely respect every ones opinion. This shows that respondents feel some group members do not respect their opinion and some members do not participate. Similarly, the students response show 16 (34.04%) some members do not participate in group work which confirms the above factors. In

other way, highest number 20 (42.55%) of respondents replied that members rarely share roles such as leader, secretary, presenter and share activities that is, collection, evaluation, or organization of evidences from resources in group work. Lowest number 3(6.38%) and 1(2.13%) of the respondents said that members always share activities that is, collection, evaluation, or organization of evidences from resources and sometimes share roles such as leader, secretary, presenter, respectively. Table 4 also shows that, of the total respondents 16 (34.04%) of them said that group assignment is always done by one

student. In other ways 18 (38.29%) of the respondents replied that some group members always forget to do their share work and 17 (36.17%) of them said as some members always get good grade without doing work. This is evidence for that 15 (31.91%) of members do not always share works equally. Thus, the data indicates as group assignment is done by one student, some members do not share works equally and still they get good grade without doing work. Similarly, Liu et al. (2010) reported as more respondents replied poor motivation, lack of individual accountability and negative

interdependence affect the implementation of group work.

Analysis of data from instructors

The interview and focus group discussion was conducted with instructors to obtain in depth information. All interviewed instructors replied that they usually implement group work in class room teaching. Similarly, all interviewees said that the students' perception about benefits of group assignment is positive since their learners prefer group assignment than individual assignment and classroom tests. However, of the instructors participated in discussion majority of them explained that their students have misconception on objectives of group work, and they reasoned out this by saying students perceive group work as a means of getting pass mark than seeing it as a means of learning cooperatively through activity. They also added students usually ask for mark without achieving task objectives. All instructors felt the extent of member's participations is usually low in general and it differs among members although, group members usually obtain the same mark. According to them this may be due to poor back ground knowledge and lack of skills in time and team work, lack of interest to accept responsibility for their learning, other personality traits such low self-esteem, low confidence, fear, motivation to mark than to work, need of dependence on dominant learners and lack of ability as main hindrance factors. Instructor's response also showed students prefer group assignment and group work than other types of assessment. The extent of every member's participations in group work was agreed up onto be low and learners' participations was seen as a varied type. The discussion also show as factors such as, learners' poor back ground knowledge of content, lack of experiences and skills in time and team work management, in searching, evaluating, and organizing evidences from various sources were reflected in group work and indicated as these factors were seen as causes for learners' lack of interest to accept responsibility in group work. Therefore, they could develop low self-esteem, low confidence, feel of fear, and sense of depending on dominant learners.

Conclusion

From data and information earlier mentioned, it is possible to conclude that group work is implemented by nearly all instructors in a fair level of frequency. Students' perception towards benefits of group assignment is also positive since learners preferred group assignment than individual assignment and classroom tests. However, students has misconception on objectives of group work, and they perceived group work as a means of getting

pass mark than seeing it as a means of learning cooperatively through activity. Therefore, students were blamed for asking mark without achieving task objectives. The students' perception towards difficulties of group work such as unfairness of group grade, making them busy, adding burden work on them, and difficulties to get together outside their classes could affect the participation. Learners' poor back ground knowledge of content, lack of experiences and skills in time and team work management, in searching, evaluating, and organizing evidences from various sources were factors which reflected as causes for learners' lack of interest to accept responsibility of learning. Therefore, they could develop low self-esteem, low confidence, feel of fear, and sense of depending on dominant learners.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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Full Length Research Paper

Teachers and students' perceptions of communicative competence in English as a foreign language in Indonesia

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This article is an attempt to formulate and design a comprehensive rationale in formulating standard of communicative competence of English for Indonesian learning English as a Foreign Language (EFL). The study focuses on the perceptions of teachers and students on what communicative competence means, and how they perceive each component of the communicative competence of English. This research is a quantitative research concentrating on finding out the perceptions of English teachers and students on communicative competence in Indonesia. The participants consist of 31 English teachers of junior and high schools in Bandar Lampung, 37 non-English Language Teaching (non-ELT) students, and 56 English Language Teaching (ELT) Students. Fifty questions are designed to find out the teachers' and students' perception of communicative competence and its components. The questions were grouped into five categories: definition of communicative competence, linguistic competence, sociolinguistic competence, discourse competence, and strategic competence. Through ANOVA statistical analysis, it was found that English teachers' perceptions on definition of communicative competence and strategic competence were not significantly different from non-English Language Teaching (non-ELT) students and ELT students. Teachers differed significantly in perceiving the linguistic, sociolinguistic, and discourse competence from that of non ELT and ELT students

Key words: Communicative competence, English teachers, English Language Teaching (ELT) and non ELT students.

INTRODUCTION

The term communicative competence has been discussed in many studies in second and foreign language learning paradigm (Canale and Swain, 1983; Savignon, 1997). This term can be considered as a subject of research study or a concept for the situation expected to be achieved by everyone who learns a second or foreign language.

In terms of linguistics, communicative competence

refers to language user's grammatical knowledge of syntax, morphology, phonology and the like, as well as social knowledge about how and when to use utterances appropriately. It made a different perception between performance and competence.

In "Theoretical Bases of Communicative Approaches to Second Language Teaching and Testing" Kees de Bot (1980) Canale and Swain (1980) identified four

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components of communicative competence. They are grammatical competence, sociolinguistic competence, discourse competence and strategic competence. Debate has occurred regarding linguistic competence and communicative competence in the second and foreign language teaching literature, and scholars have found communicative competence as a superior model of language.

In Indonesian context, English is determined as the first foreign language that must be learnt by Indonesian students from the age of ten or younger to the university level of formal education. So far, the criteria for determining the success or failure of learning of English have not been established. The use of national examination for each degree of education does not show the realistic mastery of English. The use of communicative competence (the ability to use English for oral and written communication) as the final objective of learning English, tools or instruments that can measure those abilities reliably and validly in a nationwide context.

This research is an attempt to formulate and design a comprehensive rationale in formulating standard of communicative competence of English for Indonesian EFL learners. The study focuses on the perceptions of teachers and students on what communicative competence means, and how they perceive each component of the communicative competence of English. Two research questions were formulated:

1. How do English teachers, non-English Language Teaching (non-ELT student), and ELT students perceive about communicative competence in English?
2. Are there any significant differences of perceptions on communicative competence in English among English teachers, non-ELT students and ELT students?

Answers to these two research questions bring impact to the quality of English teaching and learning in Indonesia. On one side, teachers in Indonesia are required to possess four basic competences: pedagogic, professional, social, and personality). These competences are tested in a package called uji kompetensi guru (teachers' competence test), which is compulsory to every teacher in Indonesia

In terms of professional competence, the competence tested is the mastery of the subject matter being taught, in this case, English.

The mastery of English is theoretically called communicative competence in English (Canale and Swain, 1983). On the other side, English Language Teaching Students are students who study English in order to be English teachers. These students should possess the communicative competence in order to be able to master the pedagogic competence and other professional subjects.

Identifying these teachers' and students' perception on communicative competence is necessary as the basis for determining steps to supervise English teachers and ELT students development in the future.

THEORETICAL FRAMEWORK

Communicative competence may have many interpretations, Chomsky's performance and competence theory being one of them. Chomsky defends the dichotomy between what is our real ability when using the language versus what we really know about the language; that is, what we know despite the errors we make when using the language (Trask, 1999) Savignon (1997) outlines the characteristics of communicative competence as:

1. Communicative competence is a dynamic rather than a static concept that depends on the negotiation of meaning between two or more persons who share some knowledge of the language. "In this sense, then, communicative competence can be said to be an interpersonal rather than an intrapersonal trait (P 8).
2. Communicative competence should not be thought of as only an oral phenomenon. It applies to both written and spoken language.
3. Communicative competence is context-specific, in that communication always takes place in a particular context or situation. The communicatively competent language user will know how to make appropriate choices in register and style to fit the particular situation in which communication occurs.
4. It is important to bear in mind the theoretical distinction between competence and performance. "Competence is what one knows. Performance is what one does. Performance is observable, and it is only through performance that competence can be developed, maintained, and evaluated".

A more recent survey on communicative competence by Bachman divides it into three broad headings of "organizational competence," which includes both grammatical and discourse (or textual) competence, and "pragmatic competence," which includes both sociolinguistic and "illocutionary" competence. Strategic competence is associated with the interlocutors' ability in using communication strategies (Faerch and Kasper, 1983; Lin, 2010).

Through the influence of communicative language teaching, it has become widely accepted that communicative competence should be the goal of language education, central to good classroom practice. This is in contrast to previous views in which grammatical competence was commonly given top priority. The understanding of communicative competence has been influenced by the field of pragmatics and the philosophy of language concerning speech acts as described in large part by Searle (1969) and Austin (1962).

Canale and Swain's model of communicative competence

In "Theoretical Bases of Communicative Approaches to

Table 1. Table of specification of questionnaire on communicative competence.

Aspects questioned	Question no	Total
Definition of language learning	1,2,3,4,5	5
Linguistic competence	6,7,8,9,10,11	6
Phonology	12,13, 4	3
Vocabulary	15, 16,17, 18, 19,20,21,,22	-
Structure	23,24,25	10
Sociolinguistic	26, 27,28,29,30, 31,32,33,34,35	10
Discourse	36,37,38,39,40,41,42,43,44 45,46,47	12
Strategic	48,49,50	3
Total	-	50 questions

Second Language Teaching and Testing" (Kees de Bot (1980), Michael et al. (1980) identified four components of communicative competence:

1. Grammatical competence includes knowledge of phonology, orthography, vocabulary, word formation, and sentence formation.
2. Sociolinguistic competence includes knowledge of sociocultural rules of use. It is concerned with the learners' ability to handle for example settings, topics and communicative functions in different sociolinguistic contexts. In addition, it deals with the use of appropriate grammatical forms for different communicative functions in different sociolinguistic contexts.
3. Discourse competence is related to the learners' mastery of understanding and producing texts in the modes of listening, speaking, reading and writing. It deals with cohesion and coherence in different types of texts.
4. Strategic competence refers to compensatory strategies in case of grammatical or sociolinguistic or discourse difficulties, such as the use of reference sources, grammatical and lexical paraphrase, requests for repetition, clarification, slower speech, or problems in addressing strangers when unsure of their social status or in finding the right cohesion devices. It is also concerned with such performance factors as coping with the nuisance of background noise or using gap fillers.

After Canale and Swain (1983) formulation of communicative competence, some writers have made attempts to redefine the term communicative competence in different insights and paradigms (Bálint et al., 2013; Farhady, 2005; Mohammed et al, 2009; Yano, 2003).

A major contribution to the refinement of the construct was made by Bachman, and then Bachman and Palmer in the 90s. In their approach (Bachman and Palmer, 1996), communicative competence, or to use their term, *communicative language ability*, consists of two broad areas: language knowledge and strategic competence.

Language knowledge has two main components: Organizational and pragmatic knowledge, which

complement each other. Organizational knowledge comprises knowledge of linguistic units and the rules of joining them together on the sentence and text level. Pragmatic knowledge includes illocutionary and sociolinguistic competence, where illocutionary competence concerns the knowledge of communicative action and how to carry it out, while sociolinguistic competence equals the ability to use language appropriately to the social context.

Murcia (1993) assertion of communicative by putting discourse competence as a central idea in the development of second language acquisition has been used as most important point in the development and use of competence based curriculum in Indonesia (Musthafa, 2001; Yufrizal, 2007).

This makes students and teachers in Indonesia much more familiar with terms such as 'descriptive text, argumentative, spoof, narrative text, and so on, than they do to grammatical terms such as simple sentence, compound sentence, complex sentence, or past perfect tense.

RESEARCH DESIGN

This research is a quantitative research concentrating on finding out the perceptions of students and English teachers on communicative competence in Indonesia. The subjects consist of 31 English teachers of junior and high schools in Bandar Lampung, 37 non English Language Teaching (non-ELT) students, and 56 English Language Teaching (ELT) Students. Fifty questions are designed to find out the teachers' and students' perception of communicative competence and its components. Each statement or question is supplemented by five options: strongly agree, agree, not sure, disagree and strongly disagree. The questions are arranged according to the definition of communicative competence as proposes by Canale and Swain (1983). Table 1 summarizes the content of the questionnaire. The questions are grouped into five categories:

1. Language learning definition
2. Linguistic competence
3. Sociolinguistic competence
4. Discourse competence; and
5. Strategic competence.

Table 2. Reliability statistics of the whole questionnaire.

Cronbach's Alpha	Cronbach's Alpha based on standardized items	No. of items
0.937	0.937	50

Table 3. Reliability statistics of questions on language definition.

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.511	0.504	5

Table 4. Reliability statistics of questions on linguistic competence.

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.801	0.801	3

RESULTS

Analysis of the questionnaire

Fifty questions were given to 125 respondents which consist of 31 English teachers, 56 English Language Teaching students, and 38 non-ELT students. A Cronbach alpha analysis was undertaken to test the internal reliability of the questionnaire. The result of the Cronbach alpha was 0.937, which means there is a high reliability in the questionnaires (Table 2).

Language learning definition

Five questions on the definition of language learning are prepared. The questions are:

Question 1: My students (I) learn English to (I am) enable them use the target language communicatively

Question 2: My students learn English to (I am) enable to read literature written in the target language.

Question 3: The goal of my teaching English is to enable students (me) communicate in the target language appropriately within a special social context.

Question 4: The purpose of my students learning English is to learn how to communicate by learning to think in the target language.

Question 5: The desired outcome of my students learning English is the ability to read and understand texts written in English.

Cronbach alpha analyses of the 5 questions the subject were asked was 0.511; which means that there is a relatively low internal reliability of the questions (Table 3).

Linguistic competence

Linguistic competence covers three aspects: pronunciation, grammar, and vocabulary. Six questions are prepared to ask perceptions on the aspect of pronunciation, one question for vocabulary and 13 items are prepared for structure and grammar. 25 students' and teachers' perception and their understanding of linguistics competence was answered on questions 6 (complete questions are provided in Appendix 1 and 2 of this study). A cronbach alpha analysis was undertaken to see the internal validity of these questions. The result of the cronbach alpha was 0.801; which means that the questions have significantly high internal reliability (Table 4).

Sociolinguistic competence

Sociolinguistic competence is the ability to interpret the social meaning of the choice of linguistic varieties and to use language with the appropriate social meaning for the communication situation. This includes social functions: Interacting with other people, functions used when socializing, functions used in establishing and maintaining relationships, functions involving barriers, functions involving influencing people, functions involving feedback, functions involved in arguing, functions involving avoiding trouble, self-expressive functions, functions involving expressing opinions, functions involving expressing emotions, cognitive functions, and functions for managing conversations. Questions 26 through 35 were on students and teachers perceptions on their understanding of sociolinguistic competence. The

Table 5. Reliability statistics of questions on sociolinguistic competence.

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.834	0.836	10

Table 6. Reliability statistics of questions on discourse competence.

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.905	0.907	12

Table 7. Reliability statistics of questions on strategic competence.

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of Items
0.801	0.801	3

Cronbach Alpha analysis was 0.836, which shows that there is a significantly high internal reliability of these questions (Table 5).

Discourse competence

Discourse competence is used to refer to two related, but distinct abilities. Textual discourse competence refers to the ability to understand and construct monologues or written texts of different genres. Discourse competence could also refer to the ability to participate effectively in conversations. This includes narratives, procedural texts, expository texts, persuasive (hortatory) texts, descriptions and others. These discourse genres have different characteristics, but in each genre there are some elements that help make the text coherent and other elements which are used to make important points distinctive or prominent. Questions 36 through 47 were on students' and teachers' perceptions of their understanding of competence. The Cronbach Alpha analysis was 0.905; which shows that there is a significantly high internal reliability of these questions (Table 6).

Strategic competence

This is about knowing how to recognize and repair communication breakdown, how to work around gaps in one's knowledge of the language, and how to learn more about the language in the context. This includes paraphrasing, appeal for assistance, coinage, mime, gesture, filling gaps. Three questions (questions 48 through 50) were on the teachers' and students' perceptions on their understanding of this competence. The Cronbach Alpha analysis was 0.801, which shows

that there is a significantly high internal reliability of these questions (Table 7).

Statistical analyses of teachers' and students' perceptions on communicative competence

A statistical analyses to find out whether students and teachers differ or are similar on the aspect of communicative competence was executed using Analysis of Variance (ANOVA). The steps in doing this analysis are firstly, the questions were grouped into categories. For instance, questions 1 to 5 were grouped into definition category, because these questions asked mainly about the definition of communicative competence. Questions 6 through 25 were grouped into linguistic competence category, and so on. Thus, in this case, there are five categories of questions that were asked to the respondents. The question category are: definition, linguistic competence, sociolinguistic competence, discourse, competence, and strategic competence. Table 8 shows the descriptive statistic of the categories. The result of ANOVA calculation on the perceptions of students and teachers are presented in Table 9.

Table 9 shows that in terms of definition of communicative competence, the result of ANOVA for F count was 0.385, which is higher than the $p < 0.05$. This means that teachers and students do not differ significantly in their understanding of communicative competence. All respondents seem to agree that the purpose of learning is for communicative purpose.

In terms of perception on linguistic competence, the ANOVA resulted in F value of 10.552 ($p < 0.05$) is lower than the F table. This means that teachers and students differ significantly in their perceptions of linguistic competence. Figure 1 show that ELT students perceive they understand English linguistic well, teachers believe

Table 8. Descriptive statistics of students and teachers perception on communicative competence categories.

Variable		N	Mean	Std. deviation
Definition	1	56	4.2571	0.41554
	2	31	4.3097	0.51339
	3	37	4.1568	0.50582
	Total	124	4.2403	0.46885
Linguis	1	56	3.5304	0.49915
	2	31	3.0968	0.42464
	3	37	3.6797	0.67159
	Total	124	3.4665	0.58085
Socio	1	56	3.9411	0.46389
	2	31	3.3194	0.37543
	3	37	3.9162	0.49582
	Total	124	3.7782	0.52290
Discourse	1	56	3.7336	0.50887
	2	31	3.0457	0.59076
	3	37	3.5991	0.59247
	Total	124	3.5215	0.61887
Strat	1	56	3.5774	0.79007
	2	31	3.3548	0.68818
	3	37	3.6757	0.84797
	Total	124	3.5511	0.78726

Note: 1 = ELT students; 2 = Non ELT students; 3 =English teachers.

Table 9. The analysis of variance (ANOVA) of teachers and students perceptions on communicative competence in English.

Variable		Sum of squares	df	Mean Square	F	Sig.
Definition	Between groups	0.423	2	0.212	0.962	0.385
	Within groups	26.615	121	0.220	-	-
	Total	27.038	123	-	-	-
Linguis	Between groups	6.148	2	3.074	10.522	0.000
	Within groups	35.350	121	0.292	-	-
	Total	41.499	123	-	-	-
Socio	Between groups	8.717	2	4.359	21.168	0.000
	Within groups	24.914	121	0.206	-	-
	Total	33.631	123	-	-	-
Discourse	Between groups	9.761	2	4.880	15.811	0.000
	Within groups	37.349	121	0.309	-	-
	Total	47.109	123	-	-	-
Strat	Between groups	1.807	2	0.903	1.469	0.234
	Within groups	74.425	121	0.615	-	-
	Total	76.232	123	-	-	-

their students know linguistic competence, and non ELT students are not confident whether they understand English linguistic.

In terms of sociolinguistic competence, The ANOVA resulted in $p < 0.05$. This means that teachers and students differ significantly in their perceptions of

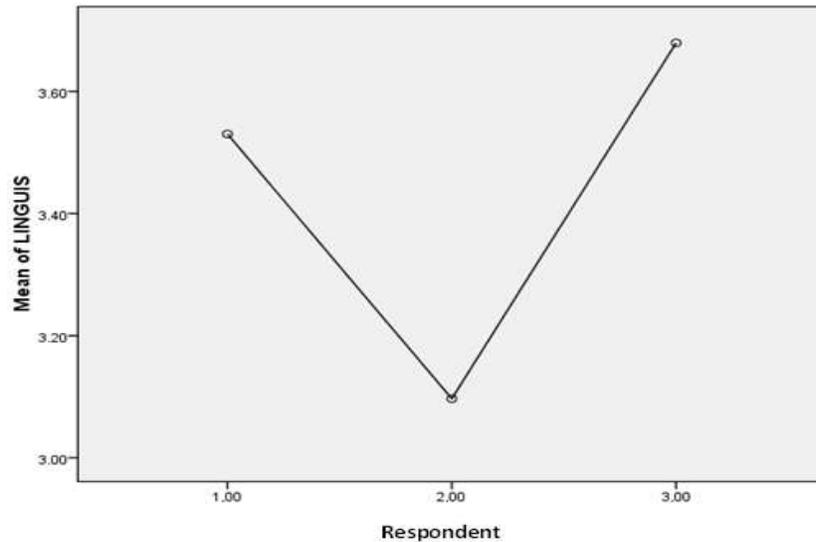


Figure 1. The comparison of students and teachers perceptions on linguistic competence. 1 = ELT students; 2 = Non ELT students; 3 = English teachers.

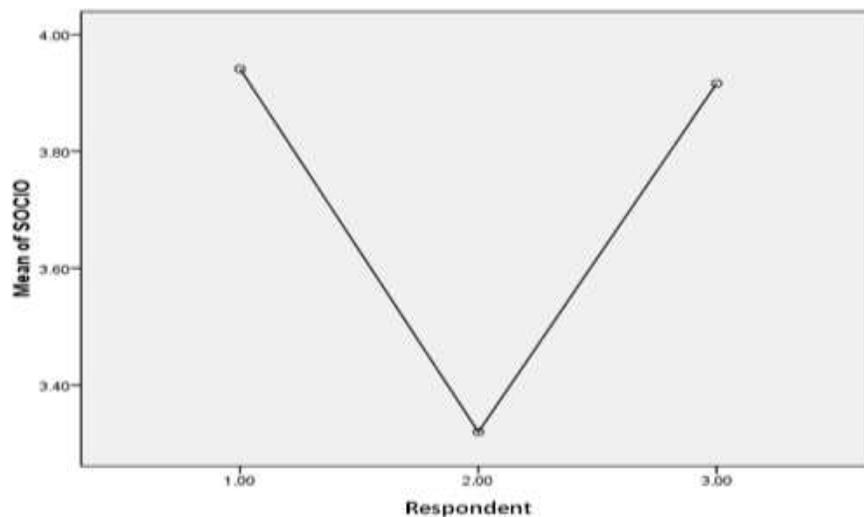


Figure 2. The comparison of students and teachers perceptions on sociolinguistic competence. 1 = ELT students; 2 = Non ELT students; 3 = English teachers.

sociolinguistic competence. Figure 2 shows that teachers believe their students are able to use the functions of sociolinguistics. ELT students believe they know the sociolinguistics aspect of English, but non-ELT students are not confidence on their sociolinguistic competence.

In terms of discourse competence, the ANOVA resulted in F value of 15.881 which is higher than the F table. This means that teachers and students differ significantly in their perceptions of discourse competence. Figure 3 shows that teachers believe their students are able to use the functions of sociolinguistics. ELT students believe they know the sociolinguistics aspect of English, but non-ELT students are not confidence on their discourse competence.

DISCUSSION

There are some interesting findings that can be found from the exposition of the data. Findings are discussed in terms of the 2013 curriculum of English syllabuses, some agreeing points between teachers and students, and some mismatch between students' and teachers' responses on the aspects of communicative competence.

Agreeing responses

Teachers and students agreed on some items asked in the questionnaire. Among the agreement between the

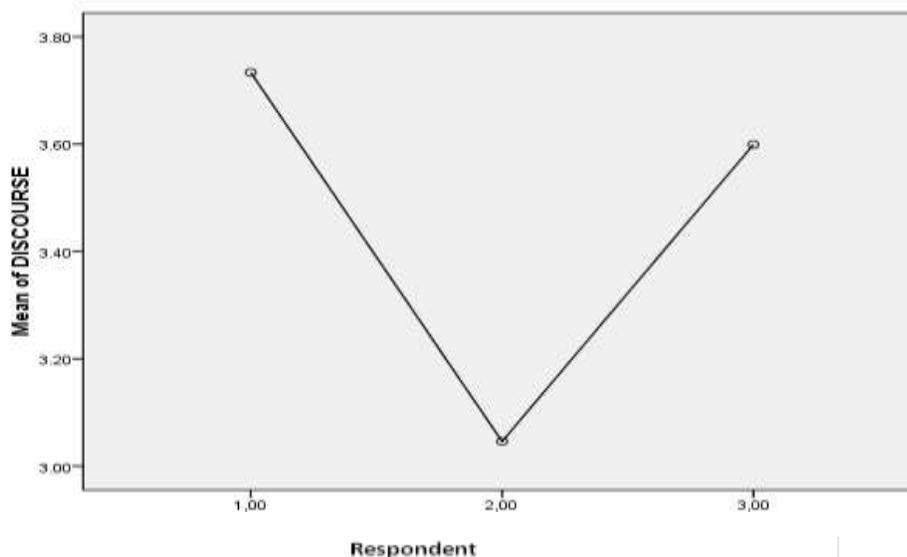


Figure 3. The comparison of students and teachers perceptions on discourse competence. 1 = ELT students; 2 = Non ELT students; 3 = English teachers.

students and the teachers is defining the purposes of teaching and learning English. In five questions asked, students and teachers seem to agree with the point that the purpose of learning English is to develop students' ability in communicating the target language. Some other points that the teachers and students seem to agree on is the understanding of text type (genre).

Agreeing can happen not only on the positive responses to the statements but also on the negative responses to the statements asked. For example, in question 6, the questionnaire states: My students are able to distinguish English vowel and diphthong sounds pronounced by native speakers, both teachers and students responded negatively. The percentage of disagreeing by the students and the teachers reaches more than fifty percent. Likewise in the statement 'My students are able to pronounce English sentences in accurate stress and intonation', the disagreement responded by the teachers reach almost 70% of the responses, and the same proportion can be found in the students' responses.

This also happens in the responses to questions no.12: My students are able to master all types of English words including content and function words', both students and teachers disagree with the statement in the proportion of more than 60%. Positive agreement can be found in the responses to questions concerning sociolinguistics function. Both students and teachers put strong agreement on the knowledge of the sociolinguistic function in questions 25 to 33.

The disagreeing responses

Some mismatch can be found particularly on the aspect

of linguistic competence. The facts are found in the incongruence between the teachers' responses and the student responses.

1. In question 25 states: 'My students are able to understand rules of word and sentence formations or structural skills of causatives, use of wish' when students respond positively (about 70%) to the statement, teachers responded negatively to the statement.
2. In statement 22, the statement says: My students are able to understand rules of word and sentence formations or structural skills of affixes and derivatives' 93.3% of the teachers who responded negatively; while 60% of students responded positively to the statement.
3. In question no.16, the questionnaire states: My students are able to understand the rules of noun phrases and constructing and presenting description texts which describe objects, using noun phrases. About 80% of the teachers disagree with the statement, while 70% of students agree with the statement.

In terms of communicative competence definition, all subjects seem to agree that the main objective of learning English as a foreign language is to enable them to communicate in the target language. They also seem to agree that the ability to communicate in the target language does not necessarily mean to have the ability like the native speakers of the language.

In terms of linguistic competence which consists of phonological, structural/grammar competence, and vocabulary competence, subjects seem to have different opinion. For the question which state the ability to listen to the native speaker, high percentage of teacher are not confident whether their student are able to do it. For the students, more than fifty percent are not confident.

However, when asked whether the students are able to pronounce the English sound, more than fifty percent of the students agree to the statement. In general, for phonological aspect, students are confident that they have the ability both in understanding the sound pronounced by native speaker as well as to pronounce the sounds. Teachers in this study are more pessimistic. They are not sure if the students have the capability of comprehending the English sounds or produce them appropriately.

For vocabulary aspect, subjects of this study seem to agree the mastery of English vocabulary is difficult. Students are not sure whether they have mastered the English vocabulary appropriately or not. Likewise, teachers also feel unsure if the students have mastered the English vocabulary sufficiently.

The grammatical aspects comprise both teachers and students negative answers to the questions. In answering whether the students are able to compose simple and complex sentences, students and teachers agree they are able to do it. Students feel they know the structural rules of noun phrases, adjective phrase, and passive and active forms of the language, but teachers are pessimistic about it, sociolinguistic aspect comprises all subjects that are confident they are able to do it. Students and teachers believe that they are able to accomplish all kinds of language function: greeting, leave taking, apologizing, feeling sorry, and so on.

Conclusion

English teachers, non ELT students, and ELT students perceived communicative competences differently. There are some agreements in the responses by both students and teachers on the aspects of communicative competence. There is also some mismatch between the responses of the teachers and students on aspects of communicative competence.

There is a tendency that students and teachers agree that English is learned in order to be able to communicate with the language. They also seem to agree that the ability to communicate in the target language does not necessarily mean they have the ability to like the native speakers of the language.

The grammatical aspect consists of both teachers and students negative answers to the questions. In answering whether the students are able to compose simple and complex sentences, students and teachers agree they are able to do it. Students feel they know the structural rules of noun phrases, adjective phrases, and passive and active forms of the language, but teachers are pessimistic about their students understanding those concepts. Sociolinguistic aspect is the aspect that all subjects confident they are able to do. Students and teachers believe that they are able to accomplish all kinds of language function: greeting, leave taking, apologizing, feeling sorry, and so on.

One of the implications of these findings might be a reformulation of the objectives of teaching and learning English in Indonesia. If discourse competence as the central point for the teaching of the Language is continued, students might be able to discuss the form and function of texts; although they may not be able to identify basic components of the language.

A further analysis on this matter will be needed in order to come up with a better formulation of the teaching practices which are theoretically and practically beneficial to both students and teachers.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Appendix 1. The questionnaire for English teacher/lecturer/instructor

Name:

Age:

1 Male

2 Female

Study Programme

Instructions: Complete the following questionnaire/scale. Write in one of the sets of letters before each numbered question based upon whether you strongly agree (SA), agree (A), Not sure (N) disagree (D), or strongly disagree (SD).

Petunjuk : Berikut terdapat sejumlah pernyataan tentang bahasa Inggris dan pembelajarannya. Bacalah setiap pernyataan tersebut dengan baik dan pilih yang sesuai dengan pendapat anda, dengan cara memberi ceklis / contreng (✓) pada kotak pilihan yang sesuai. Perlu diketahui, tidak ada jawaban "salah" atau "benar" yang penting sesuai dengan keadaan anda sebenarnya dengan memberikan satu pilihan pada 4 alternatif yaitu a, b, c atau d sesuai dengan pilihan anda.

STS = Sangat Tidak Setuju, TS = Tidak Setuju, TT= Tidak tahu S = Setuju SS=Sangat Setuju

S/N	Statement	SA	A	N	D	SD
1	Siswa saya belajar bahasa Inggris supaya mampu menggunakan bahasa Inggris untuk berkomunikasi					
	My students learn English in order that they are able to use the target language communicatively					
2	Siswa saya belajar bahasa Inggris supaya mampu membaca literature dalam bahasa Inggris					
	My students learn English in order that they are able to read literature written in the target language					
3	Tujuan pengajaran bahasa Inggris adalah membuat siswa mampu berkomunikasi dalam bahasa Inggris secara tepat dalam konteks social tertentu					
	The goal of my teaching English is to enable students to communicate in the target language appropriately within a special social context					
4	Tujuan siswa belajar bahasa Inggris adalah untuk berkomunikasi dengan cara belajar berfikir dalam bahasa Inggris					
	The purpose of my students learning English is that students learn how to communicate by learning to think in the target language					
5	Hasil yang diharapkan dari pembelajaran bahasa Inggris adalah kemampuan membaca dan memahami teks dalam bahasa Inggris					
	The desired outcome of my students learning English is the ability to read and understand texts written in English					
6	Siswa saya mampu membedakan bunyi vocal dan diptong yang diucapkan penutur asli bahasa Inggris					
	My students are able to distinguish English vowel and diphthong sounds pronounced by native speakers					
7	Siswa saya mampu mengucapkan bunyi vocal dan diptong bahasa Inggris secara tepat					
	My students are able to pronounce English vowels and diphthong perfectly					
8	Siswa saya mampu membedakan bunyi konsonan bahasa Inggris diucapkan oleh penutur asli					
	My students are able to distinguish English consonant sounds pronounced by native speakers					
9	Siswa saya mampu mengucapkan bunyi konsonan bahasa Inggris secara sempurna					
	My students are able to pronounce English consonants perfectly					
10	Siswa saya mampu membedakan intonasi dan tekanan bahasa Inggris diucapkan oleh penutur asli					
	My students are able to distinguish English stress and intonation pronounced by native speakers					
11	Siswa saya mampu mengucapkan kalimat bahasa Inggris dengan tekanan dan intonasi yang tepat					
	My students are able to pronounce English sentences in accurate stress and intonation					

Appendix 1. Contd.

12	Siswa saya mampu menguasai semua kosakata bahasa Inggris termasuk content dan function words My students are able to master all types of English words including content and function words						
13	Siswa saya mampu menyusun kalimat bahasa Inggris sederhana yang benar secara gramatika My students are able to arrange simple English sentences grammatically correct						
14	Siswa saya mampu menyusun kalimat bahasa Inggris kompleks yang secara gramatika tepat My students are able to arrange complex English sentences grammatically correct						
15	Siswa saya mampu mengenali dan menggunakan kata-kata bahasa Inggris sama seperti yang dilakukan oleh penutur asli My students are able to recognize and use words in a language in the way that speakers of the language use them						
16	Siswa saya mampu memahami rumusan frasa kata benda, menyusun dan mempresentasikan teks descriptive yang menggunakan frasa kata benda sebagai objek My students are able to understand the rules of noun phrases and constructing and presenting description texts which describe objects by using noun phrases						
17	Siswa saya mampu memahami rumusan tata susun kata dan kalimat atau keterampilan penguasaan struktur tenses My students are able to understand rules of word and sentence formations or structural skills of tenses						
18	Siswa saya mampu memahami rumusan tata susun kalimat atau keterampilan structural kalimat pasif dan aktif dalam bahasa Inggris My students are able to understand rules of word and sentence formations or structural skills of active and passive voices						
19	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>direct and indirect speeches</i> My students are able to understand rules of word and sentence formations or structural skills of direct and indirect speeches						
20	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>degrees of comparison</i> My students are able to understand rules of word and sentence formations or structural skills of degrees of comparison						
21	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>gerunds dan infinitives</i> My students are able to understand rules of word and sentence formations or structural skills of gerunds and infinitives						
22	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>affixes dan derivative</i> My students are able to understand rules of word and sentence formations or structural skills of affixes and derivatives						
23	Siswa saya mampu memahami rumusan tata kata dan kalimat conditionals My students are able to understand rules of word and sentence formations or structural skills of conditional sentences						
24	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>relative/adjective clauses</i> My students are able to understand rules of word and sentence formations or structural skills of relative/adjective clauses						

Appendix 1. Contd.

25	Siswa saya mampu memahami rumusan tata kata dan kalimat <i>causative use of wish</i>					
	My students are able to understand rules of word and sentence formations or structural skills of causatives, use of wish					
26	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk narasi					
	My students are able to apply their English knowledge to communicate narrative action					
27	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi deskriptif					
	My students are able to apply their English knowledge to communicate descriptive function					
28	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi persuasive					
	My students are able to apply their English knowledge to communicate persuasive function					
29	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi ucapan terima kasih					
	My students are able to apply their English knowledge to communicate gratitude function					
30	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi apologi					
	My students are able to apply their English knowledge to communicate apologizing function					
31	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi komplimentari					
	My students are able to apply their English knowledge to communicate complimentary function					
32	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi penyesalan					
	My students are able to apply their English knowledge to communicate regretting function					
33	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi request					
	My students are able to apply their English knowledge to communicate request function					
34	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi penolakan					
	My students are able to apply their English knowledge to communicate rejecting function					
35	Siswa saya mampu mengaplikasikan pengetahuannya untuk berkomunikasi dalam bentuk fungsi simpatetik					
	My students are able to apply their English knowledge to communicate symphatetic function					
36	Siswa saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre puisi					
	My students are able to combine grammatical forms and meanings to achieve texts in the genre of poems					
37	Siswa saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre teks prosedur					
	My students are able to combine grammatical forms and meanings to achieve texts in the genre of procedures					
38	Siswa saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre teks deskripsi					
	My students are able to combine grammatical forms and meanings to achieve texts in the genre of descriptions					
39	Siswa saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre reports					
	My students are able to combine grammatical forms and meanings to achieve texts in the genre of reports					
40	Siswa saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre news items					
	My students are able to combine grammatical forms and meanings to achieve texts in the genre of news items					

Appendix 2. The questionnaire for English learners

Name:

Age:

1 Male

2 Female

Study Programme

Instructions: Complete the following questionnaire/scale. Write in one of the sets of letters before each numbered question based upon whether you strongly agree (SA), agree (A), Not sure (N) disagree (D), or strongly disagree (SD).

Petunjuk : Berikut terdapat sejumlah pernyataan tentang bahasa Inggris dan pembelajarannya. Bacalah setiap pernyataan tersebut dengan baik dan pilih yang sesuai dengan pendapat anda, dengan cara memberi ceklis / conteng (✓) pada kotak pilihan yang sesuai. Perlu diketahui, tidak ada jawaban "salah" atau "benar" yang penting sesuai dengan keadaan anda sebenarnya dengan memberikan satu pilihan pada 4 alternatif yaitu a, b, c atau d sesuai dengan pilihan anda.

STS = Sangat Tidak Setuju, TS = Tidak Setuju, TT= Tidak tahu S = Setuju SS=Sangat Setuju

S/N	Statement	SA	A	N	D	SD
1	Saya belajar bahasa Inggris supaya mampu menggunakan bahasa Inggris untuk berkomunikasi					
	I learn English in order that they are able to use the target language communicatively					
2	Saya belajar bahasa Inggris supaya mampu membaca literature dalam bahasa Inggris					
	I learn English in order that I am able to read literature written in the target language					
3	Tujuan pengajaran bahasa Inggris adalah membuat saya mampu berkomunikasi dalam bahasa Inggris secara tepat dalam konteks social tertentu					
	The goal of my teaching English is to enable me to communicate in the target language appropriately within a special social context					
4	Tujuan saya belajar bahasa Inggris adalah untuk berkomunikasi dengan cara belajar berfikir dalam bahasa Inggris					
	The purpose of my learning English is that students learn how to communicate by learning to think in the target language					
5	Hasil yang diharapkan dari pembelajaran bahasa Inggris adalah kemampuan membaca dan memahami teks dalam bahasa Inggris					
	The desired outcome of my students learning English is the ability to read and understand texts written in English					
6	Saya mampu membedakan bunyi vocal dan diptong yang diucapkan penutur asli bahasa Inggris					
	I am able to distinguish English vowel and diphthong sounds pronounced by native speakers					
7	Saya mampu mengucapkan bunyi vocal dan diptong bahasa Inggris secara tepat					
	I am able to pronounce English vowels and diphthong perfectly					
8	Saya mampumembedakan bunyi konsonan bahasa Inggris diucapkan oleh penutur asli					
	I am able to distinguish English consonant sounds pronounced by native speakers					
9	Saya mampu mengucapkan bunyi konsonan bahasa Inggris secara sempurna					
	I am able to pronounce English consonants perfectly					
10	Saya mampu membedakan intonasi dan tekanan bahasa Inggris diucapkan oleh penutur asli					
	I am able to distinguish English stress and intonation pronounced by native speakers					
11	Saya mampu mengucapkan kalimat bahasa Inggris dengan tekanan dan intonasi yang tepat					
	I am able to pronounce English sentences in accurate stress and intonation					
12	Saya mampu menguasai semuakosa kata bahasa Inggris termasuk content dan function words					
	I am able able to master all types of English words including content and function words					

Appendix 2. C Contd.

28	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi persuasive					
	I am able to apply their English knowledge to communicate persuasive function					
29	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi ucapan terima kasih					
	I am able to apply their English knowledge to communicate gratitude function					
30	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi apology					
	I am able to apply their English knowledge to communicate apologizing function					
31	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi komplimentari					
	I am able to apply their English knowledge to communicate complimentary function					
32	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi penyesalan					
	I am able to apply their English knowledge to communicate regretting function					
33	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi request					
	I am able to apply their English knowledge to communicate request function					
34	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi penolakan					
	I am able to apply their English knowledge to communicate rejecting function					
35	Saya mampu mengaplikasikan pengetahuan saya untuk berkomunikasi dalam bentuk fungsi simpatetik					
	I am able to apply their English knowledge to communicate symphatetic function					
36	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre puisi					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of poems					
37	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre teks prosedur					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of procedures					
38	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre teks deskripsi					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of descriptions					
39	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre reports					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of reports					
40	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre news items					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of news items					
41	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre naratif					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of narratives					
42	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre recounts					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of recounts					
43	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre spoofs					
	I am able to combine grammatical forms and meanings to achieve texts in the genre of spoofs					
44	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre expositions					

Appendix 2. Contd.

	I am able to combine grammatical forms and meanings to achieve texts in the genre of expositions					
45	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre argumentative I am able to combine grammatical forms and meanings to achieve texts in the genre of argumentative					
46	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre reports I am able to combine grammatical forms and meanings to achieve texts in the genre of reports					
47	Saya mampu menggabungkan bentuk dan makna gramatikal untuk memahami teks bergenre announcement I am able to combine grammatical forms and meanings to achieve texts in the genre of announcement					
48	Saya mampu menggunakan isi bahasa yang relevan seperti fungsi bahasa/ekspresi bahasa secara jelas dan teratur dalam bentuk yang koheren I am able to use relevant language contents such as language functions/English expressions clearly in an organized and coherent way					
49	Saya mampu menggunakan isi bahasa yang relevan seperti fungsi bahasa/ekspresi bahasa secara jelas dan teratur dalam bentuk yang sesuai dengan genre dan situasi komunikatif I am able to use relevant language contents such as language functions/English expressions clearly according to the genre and communicative situation					
50	Saya mampu menggunakan isi bahasa yang relevan dan mengekspresikannya menggunakan tekanan suara, bahasa tubuh, dan gesture yang tepat I am able to select the relevant contents and expressing them using the appropriate tones of voice, body language, and gestures					

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