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Optimizing Oral Communication Skills Through the Use of the RADEC Learning Model in Basic Natural Science Concepts Courses

[1]Iyoh Maspiroh, [2]Nur Rohmatillah, [3]Nandang Kusmana, [4]Yuliana Aristian
[134]STKIP Babunnajah Pandeglang
[2]Universitas Islam Al Ihya Kuningan
[1]iyohmaspiroh@gamil.com, [2]**rohmatillah.irma@gmail.com**
[3]nandang.kusmana6886@gmail.com,[4]yulianaaristian@gmail.com

Abstract

This research aims to determine the effect of using the RADEC learning model on the oral communication skills of elementary school teacher education students. Much research has been carried out regarding the RADEC learning model. However, most focus on learning outcomes and students' thinking abilities. So far, no research has been found regarding the influence of the RADEC learning model on students' oral communication skills and this research attempts to fill this gap. The research population consisted of 125 elementary school teacher education students. The research sample was taken by purposive sampling with a total of 25 students in the experimental class and 25 students in the control class. Oral communication skills were assessed using an observation instrument. Because the data were not normally distributed, differences between groups were analyzed using the Mann–Whitney U test. The results showed that the experimental group achieved significantly higher oral communication skills than the control group (Mean = 43.3 vs. 27.3; U = 0.00, p = 0.002), with a very large effect size (rank-biserial correlation = 1.00). These findings suggest that the RADEC learning

model is an effective and innovative approach for fostering 21st-century communication skills in teacher education.

Keywords: RADEC; innovative learning model; oral communication skills; pre-service teachers; 21st-century skills.

Introduction

Universities around the world are increasingly seeking to prepare graduates with specific soft skills to complement hard skills to prepare them to thrive in a rapidly changing and dynamic world. While hard skills are relatively easy to define and develop, soft skills are not, despite the fact that soft skills are increasingly recognized as equally important, if not more important, for students majoring in education who will later become teachers.(Karras, 2022). One of the soft skills that students need to have as prospective teachers is oral communication skills(Chaudhari, 2021). This study was conducted in the Basic Natural Science Concepts course because the course emphasizes conceptual understanding through classroom discussions, scientific explanations, and student presentations. These learning activities require students to communicate scientific ideas clearly and effectively, making the course an appropriate context for examining the development of oral communication skills.

Communication skills are one of the 21st century teaching competencies that a teacher must have. The development of competencies known as 21st century skills is increasingly receiving attention as a means of improving the quality of teacher teaching(Kim et al., 2019).Communication skills are the qualities necessary to achieve goals that include personal and interpersonal qualities as well as social

abilities. This skill is a soft skill that allows someone to "read" other people. These skills are needed in the workplace, such as teachers working in schools in educating students or other professions, because almost all careers require involvement or interaction with other people.(Gioiosa & Kinkela, 2019). Research related to communication skills has been conducted in various countries such as California, Romania, and Hong Kong which reports that interpersonal skills, communication skills, and problem solving are very important and needed in the workplace.(Al-Alawneh et al., 2019).

Likewise, prospective elementary school teacher students must have good communication skills.21st century teachers are not only required to be able to teach and manage classes well, but 21st century teachers must also be able to build good relationships with students and the school community as capital for realizing effective learning.(Yusof & Halim, 2014). Good communication skills can create a quality learning process(Yudintseva, 2023).

However, these communication skills have not developed optimally. Studies related to communication skills show that high school graduates, diplomas and higher education, tend to be less competent in communicating, both orally and in writing (Trilling & Fadel, 2009). This is in line with research conducted by Sulistyaningrum (2019) showing that the communication skills of prospective elementary school teacher students are still relatively low.

Apart from that, empirical studies while teaching basic concepts of natural science courses found that students were not skilled in communicating. In terms of content, students have not demonstrated comprehensive understanding. In terms of style, students read papers more than explaining important points interactively with the audience. In terms of presentation tools, students tend to provide too much information with a very small font size on the power point presented.

One innovative learning model that can improve students' communication skills is the RADEC learning model. The RADEC learning model is a learning model that consists of 5 activity stages, namely read, answer, discuss, explain, and create (Sopandi, 2017). This learning modelcan encourage students to acquire 21st century skills. In the 21st century, there are several competencies that humans must have, namely critical thinking, collaboration and communication and can help students build character and improve conceptual understanding. (Handayani & Sopandi, 2018).

The RADEC learning model was developed on the basis of the Indonesian education system which requires students to understand many scientific concepts in a limited time. This model can be the latest breakthrough in education which aims to achieve 21st century competencies, character and literacy accompanied by preparation for exams held by schools or universities. Several studies have also proven that the RADEC learning model has a positive impact on learning outcomes,

both material-oriented, namely understanding concepts (Lukmannudin, 2018).Even though it is still relatively new, much research has been carried out on the RADEC learning model. Recent research on the RADEC learning model which is integrated with sustainable development education can help students have sustainable awareness in all aspects(Lestari et al., 2022; Suratmi et al., 2022). Other research shows that the use of the RADEC learning model in the learning process from elementary school to tertiary level can improve students' high-level thinking abilities.(Fuadi et al., 2021; Handayani et al., 2019; Satria & Sopandi, 2019; Sukardi et al., 2022). However, there has been no research that focuses on the effect of RADEC on communication skills in basic natural science concepts courses in elementary schools. This is especially needed for prospective elementary school teacher students. One of the main subjects in elementary schools based on the curriculum structure is natural science subjects.

Based on the description of the problem above, this research aims to determine the effectiveness of the RADEC learning model in optimizing the oral communication skills of elementary school teacher education students in basic concepts of natural science courses at universities in Pandeglang Regency, Banten Province. From these objectives, the research questions for this study are:

- Is the RADEC learning model effectively used to improve students' oral communication skills in lectures on basic natural science concepts in higher education?

Literature Review

The name of the RADEC learning model is adjusted to the learning syntax so that it is easy to remember the order of implementation (Sopandi, 2021). The RADEC learning model was first introduced at an international conference in Kuala Lumpur, Malaysia, in 2017 and was developed as an instructional approach that aligns with the characteristics and educational context of Indonesian students (Sopandi, 2017).

Sopandi (2017) states that there are four foundations for developing the RADEC learning model, namely: 1) The RADEC learning model was developed on the basis of national education goals, namely to develop all the potential of students to become human beings who believe in God, are noble, healthy, knowledgeable, capable, creative. , be independent, and become democratic and responsible citizens, 2) this model was developed on the basis of Vygotski's social constructivism theory which suggests that cognitive abilities in children can develop through interaction with the social environment. 3) facts show that nowadays learning resources, whether in the form of books or other sources such as the internet, are

easy for students to obtain. Thus, for schools that already have sources of information other than teachers, students can obtain information independently before class activities. 4) reading skills will develop in a literacy-based learning environment such as the RADEC learning model. In literacy-based learning, the core activities in the classroom include reading-thinking-writing.

Step-The steps of the RADEC model proposed by Sopandi (2017) are Read, Answer, Discuss, Explain and Create. A more detailed explanation of each stage of the RADEC model is as follows.

1) *Read*

In this step, students readinformation from various sources including books, other printed information sources and electronic information sources such as the internet. In an effort to encourage students to understand the information, students are given pre-learning questions. The questions given to students are questions related to the material to be studied. The pre-learning questions given are certainly not questions that are only low order thinking (LOT) but questions that can develop students' high-level thinking abilities (HOTS), namely at the analyze, evaluate and create levels. Apart from that, pre-learning reading activities outside of learning time are based on students being able to obtain some of the information they need themselves without having to explain it to the teacher or help from other people.

2) Answer

At this stage, students answer pre-learning questions on the student worksheet. Through this activity, students can prove that they are able to learn independently and students can identify what things students have difficulty in answering pre-learning questions. Pre-learning questions given by teachers to students can encourage students to gain a deeper understanding of the information they read.

3) *Discuss*

At the discussion stage, students study in groups to discuss students' answers to pre-learning questions. In this activity, the teacher encourages students to discuss actively. Teachers also provide motivation to students who successfully complete assignments and answer them well. For students who have not successfully completed their assignments, the teacher provides motivation and the teacher provides opportunities for students who have not yet mastered the learning material to ask students who have mastered it.

4) *Explain*

At this stage, students are asked to explain classically the material that has been discussed. In this activity, the teacher ensures that what the presenter explains is scientifically correct and can be understood by other students. Apart from that,

the teacher also encourages other students to ask questions, refute, or add to what their friends from other groups have said. Apart from students who make presentations. At this stage, the teacher can also explain essential important material.

5) Create

At this stage, the teacher provides encouragement and inspires students to use the knowledge they have mastered to produce research ideas and problem solving, then the final result of the problem solving can be a product.

The RADEC learning model has several advantages, including:

- The syntax of the RADEC model is easy for primary and secondary education teachers to memorize (Sopandi, et.al., 2019), so it is suitable for use as an alternative innovative learning model in Indonesia.
- This learning model was developed on the basis of the Indonesian education system which requires students to understand many scientific concepts in a limited time. This model can be the latest breakthrough in education which aims to achieve 21st century competencies, character and literacy accompanied by preparation for exams held by schools or universities. Several studies have also proven that the RADEC learning model has a positive impact on learning

outcomes, both material-oriented, namely understanding concepts (Lukmannudin, 2018).

- Can encourage students to have 21st century abilities. In the 21st century, there are several competencies that humans must have, namely critical thinking, collaboration and communication and can help students build character and improve conceptual understanding (Handayani & Sopandi, 2018).
- Based on the description of the RADEC learning model, it can be concluded that the RADEC learning model is a learning model that suits the characteristics of students in Indonesia which encourages students to make preparations before the learning process begins, namely reading, writing and solving problems related to the material to be studied in class. This model has five stages whose implementation is divided into 2 phases, namely the phase during the learning process, and the second is the phase outside the classroom.
  - Out-of-class phase :Read, Answer, stage
  - Phases in class :Discuss, Explain, and Create stages.

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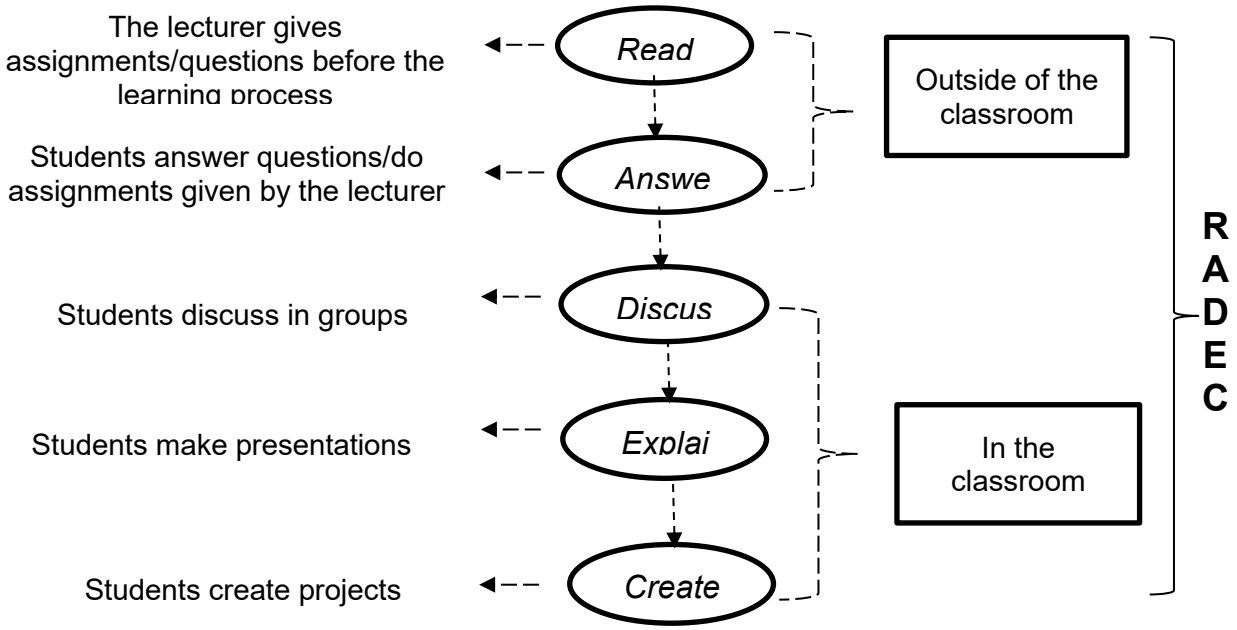

Figure 1. Stages of Implementing the RADEC Learning Model

Method

This quasi-experimental research was conducted at a university in Pandeglang Regency, Banten, elementary school teacher education study program during lectures on basic natural science concepts. The research population consisted of 125 third semester students consisting of 5 classes.This research uses 2 classes, namely the experimental class and the control class.The experimental class consists of 25 students with the learning process using the RADEC learning model. The same thing as the experimental class, the control class consists of 25 students

but the learning process uses the PBL (Problem Based Learning) model. The research design is shown in table 1.

Table 1. Research Design Nonrandomized Control Group Pretest-Posttest Design

Group	Treatment		
Group 1	Obs	Tx	Obs
Group 2	Obs	-	Obs

Source: Leedy & Ormrod(2013:237)

Information:

Obs =observation

Tx =experimental treatment

\- = without experimental treatment

This research was carried out in 3 face-to-face meetings where the first to third meetings carried out learning activities on natural science concepts with the two classes receiving different treatment (the experimental class used the RADEC learning model and the control class used the PBL learning model.There are two observers in each class who are assigned to observe students' communication skills during presentations and discussions.

In the experimental class, 7 days before learning begins in class, the lecturer sends assignments/questions related to the material that will be delivered via the course social media WhatsApp group. The lecturer asks students to complete the assignments/questions and send the answers 1 day before the lecture starts. Meanwhile, in the control class which uses the PBL learning model, the lecturer does not give assignments or questions related to the material that will be studied at next week's meeting. In each experimental and control class, students were divided into 5 (five) discussion groups. Each class is observed by 2 (two) observers by dividing observation groups. Observer A observed communication skills in groups 1 and 2, while observer B observed groups 3, 4 and 5.

Research instruments

The instrument used to observe students' oral communication skills was an observation sheet adapted from Huba, ME, & Freed, JE (2000: 156-157). The observation sheet is used to determine the percentage of achievement of students' oral communication skills during the presentation stage, namely during the explain stage. There are two observers in each class who are assigned to observe the learning process. In filling it in, the observer gives a checklist mark in the assessment column. The interpretation of the assessment is a score of 3 for "sophisticated"

abilities, a score of 2 for "competent" and a score of 1 for "not yet competent". Apart from the checklist column, a description column is also provided to contain explanations of what occurred during the observation.

In the experimental class, learning was conducted using the RADEC learning model, which consists of the Read, Answer, Discuss, Explain, and Create stages. During the Explain stage, students presented their ideas and participated in classroom discussions, providing opportunities to develop and demonstrate their oral communication skills. In contrast, the control class received conventional instruction consisting of teacher explanations, question-and-answer sessions, and individual assignments without implementing the structured RADEC learning stages. Both classes were taught the same learning content, learning objectives, duration, and assessment procedures, with the learning model being the only difference between the two groups.

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Table 2. Student communication skills rubric grid adapted fromHuba, ME, & Freed, JE (2000: 156-157)

Component	3-Advanced	2-Competent	1-Not yet competent
Organization	Presentation is clear, logical, and organized. Listeners can follow the flow of reasoning.	Presentations e generally clear d well organized. me minor points y be confusing.	Haphazard organization; listeners can follow the presentation with just effort. The argument is unclear.
Style	The appropriate level of presentation for the audience. A presentation is a planned conversation, proceeding for the audience's understanding. This is not reading a paper. The speaker is comfortable in front of a group and can be heard by everyone.	The level of presentation is generally appropriate. Pacing is sometimes too fast or too slow. The presenter seemed a little uncomfortable at times, and the audience sometimes had difficulty hearing him.	Aspects of the presentation are too basic or too advanced for the audience. The presenter appears uncomfortable and can only be heard if the listener is very attentive. Lots of information to read.

Use of Communication Aids	Communication tools enhance presentations. • The font on the visual is readable. • Information is presented and organized to maximize audience understanding. • Details are minimized so that the main points stand out.	Communication aids contribute to the quality of the presentation. • The font size is mostly readable. • Appropriate information is included. • Some materials are not supported by visual aids.	Communication aids are not prepared properly or are used inappropriately. • Font size is too small to read. • Too much information included. • Details or some unimportant information are highlighted, and can confuse the audience.
Contents			
Content Depth	Speakers provide accurate and complete explanations of key concepts and theories, using relevant literature.	For the most part, explanations of concepts and theories are accurate and complete.	Explanation of concepts and/or theories is inaccurate or incomplete. Little effort is made to tie theory to

Content Accuracy	The application of theory illuminates the problem. Listeners gain insight. The information (names, facts, etc.) included in the presentation is consistently accurate.	Several useful apps are included. No significant errors were made. The listener recognizes any errors as the result of nervousness or confusion.	practice. The listener gets little out of the presentation. Enough mistakes are made to distract an informed listener. Some information is accurate but the listener must determine what information is reliable.
Use of Language			
Grammar and Word Choice	Complete and grammatical sentences. They flow together easily. The words are well chosen; they express the intended meaning precisely.	Complete sentences and grammar for the most part. They flow together easily. With a few exceptions, the words are well chosen and precise.	Listeners were able to follow the presentation, but they were distracted by some grammatical errors and use of slang. Some sentences are disjointed, incomplete, or have limited or

			imprecise vocabulary.
Freedom from Bias (e.g., sexism, racism, heterosexism, agism, etc.,)	Both spoken language and body language are free from bias.	Spoken language and body language are free from bias with one or two minor exceptions.	Spoken language and/or body language includes several identifiable biases. Some listeners will be offended.
Responsive to Audience			
Verbal Interaction	Consistently clarify, restate, and respond to questions. Summarize when necessary.	Generally responsive to audience questions and needs. Missed several opportunities to interact.	Responds inadequately to questions.

Data collection

Data collection was carried out using an observation sheet equipped with an assessment rubric. The assessment rubric grid is shown in Table 2.

Data analysis

Data were analyzed using *independent t-test* to determine the significance of differences in student communication skills in the control group and treatment group. *Independent t-test* can be done if the data is normally distributed so that normality and homogeneity tests are first carried out. The normality test was carried out using the method *Kolmogorof Smirnof* And *Shapiro-Wilk*, which is normally distributed if sig. > 0.05. Test homogeneity using the method *Levine's Test,* which is homogeneous if sig. > 0.05. The communication skills of students in the control group and the experimental group are significantly different if sig. < 0.05 with the confidence level of the test used being 95%.

Data was also analyzed descriptively for each indicator of communication skills.The way to calculate the percentage score on the learning implementation observation sheet is as follows:

$$P = \frac{\text{Total score obtained on each indicator}}{\text{Maximum total score}} \times 100\%$$

The conversion percentage score for the observation sheet is in Table 2 below.

Table 3. Percentage Conversion of Learning Implementation Observation Scores

Percentage Interval (%)	Criteria
90-100%	Very good
80-89 %	Good
70-79%	Enough
60-69%	Not enough
>50%	Very little

Source: Arifin (2012: 236)

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Finding

The descriptive assessment scores for each group obtained the following results:

Table 4. Scores from Observation Results of Communication Skills in Each Group

Components of oral communication skills	Experimental Class						Control Class					
	Score Per Meeting			Total score	Percentage (%)	Criteria	Score Per Meeting			Total score	Percentage (%)	Criteria
	1	2	3				1	2	3			
Organization	12	15	15	42	93%	Very good	7	10	10	20	44%	Very little
Style	13	15	13	41	91%	Very good	10	10	7	27	60%	Not enough
Use of communication aids	15	14	14	43	95%	Very good	11	12	12	35	78%	Enough

Depth of content	15	15	14	39	87%	Good	10	9	9	28	62%	Not enough
Content accuracy	14	13	15	42	93%	Very good	9	11	8	28	62%	Not enough
Grammar and word choice	14	13	13	40	89%	Good	12	13	13	38	84%	Good
Freedom from bias	15	14	14	43	95%	Very good	14	14	14	42	93%	Very good
Verbal interaction	13	14	14	41	91%	Very good	10	12	10	32	71%	Enough

Based on data analysis, the results obtained were that in the experimental class, it showed that each component of oral communication skills received a score in the very good category, one component was included in the good category, namely the grammar component. Meanwhile, for the control class, the results obtained showed that the organizational component was in the very poor category, the style component, depth of content, content accuracy was in the poor category, the component of using communication aids and verbal interaction was in the sufficient category, the grammatical component and word choice is in the good category, and the freedom from bias

component is in the very good category.

Interestingly, both the experimental and control groups achieved the same performance category ("Good") for the grammar and word choice component, although the experimental group obtained a slightly higher percentage score (89%) than the control group (84%). This finding suggests that grammatical accuracy and word choice may be influenced not only by the learning model but also by students' prior language proficiency and previous academic experiences. Unlike other communication components, such as organization, verbal interaction, and content presentation, which require active collaboration and discussion, grammar and vocabulary development generally require continuous language practice over a longer period. Therefore, while the RADEC learning model substantially improved students' overall oral communication skills, its short-term effect on grammatical accuracy appeared to be less pronounced.

Quantitative analysis showed that students in the experimental group achieved higher oral communication skills than those in the control group. The mean oral communication score of the experimental group was 43.3, whereas the control group obtained a mean score of 27.3. Furthermore, the Mann–Whitney U test indicated a statistically significant difference between the two groups ($U = 0.00$, $p = 0.002$), demonstrating that the RADEC learning model significantly improved students' oral communication skills.

The results of the oral communication ability data were then analyzed to see the normality and homogeneity of the data using Jamovi. The homogeneity test results are in table 1 below.

Homogeneity of Variances Test (Levene's)

	F	df	df2	p
observation score	0.815	1	12	0.384

Note. A low p-value suggests a violation of the assumption of equal variances

Figure 3. Homogeneity test results

Based on the data in figure 3, it can be seen that p (0.384) > 0.05, which means that the data is homogeneous. This shows that the control class and experimental class have the same abilities.

Normality Test (Shapiro-Wilk)

	W	p
observation score	0.818	0.008

Note. A low p-value suggests a violation of the assumption of normality

Figure 4. Normality test of oral communication skills.

Based on the data in figure 4, it can be seen that p (0.008) ≤0.05, which means the data is not normally distributed. So the difference test was carried out using the Mann Whitney U test assisted by Jamovi and the results are shown in figure 5.

Independent Samples T-Test

						95% Confidence Interval			
		Statistics	p	Mean difference	SE difference	Lower	Upper		Effect Size
observation score	Mann-Whitney U	0.00	0.002	-15.0		-18.0	-12.0	Rank biserial correlation	1.00

Note. H_a μ control $\neq$ μ experimental

The analysis test results in figure 5 show that p (0.002) <0.05, so it can be concluded that H0 is rejected and Ha is accepted, which means that the average oral

communication ability of experimental class students is significantly different from that of the control class. So it can be concluded that the RADEC learning model has an effect on the oral communication skills of elementary school teacher education students.

Discussion

Overall research findings reveal that the RADEC learning model is proven to improve the communication skills of elementary school teacher education students. This is very different from the control class which uses the PBL learning model.

At the first meeting when material on the digestive system is given, students adapt to the RADEC learning model given. In the RADEC learning model, students appear to be more prepared to participate in class learning, this can be seen from the language organization of the material presented being more organized, the suitability of the presentation style as indicated by not looking too much at the text being read, the content or material presented being deeper and more detailed. accurate because it was obtained from various sources.

Students' readiness to take part in learning and presenting discussion results so that they have good oral communication skills because in the RADEC learning model there is a Read stage (reading) which is carried out outside of learning activities at home). At this stage, students are given pre-learning questions about the material they will study at the

next meeting. So, students can look for answers or explanations to the questions given by using various sources, both internet sources and library books (Sopandi, 2021).

Improving the oral communication skills of elementary school teacher education students when using the RADEC learning model is supported by student activities at the Read stage or reading material from various sources on the internet related to questions given at the pre-learning stage. So that students are prepared when participating in the learning process in class.

This is in accordance with Sopandi (2021) who states that at the Read stage students will gain an understanding of the material first before studying it in class. At this stage, students are given the opportunity to explore information from various sources in order to answer questions independently.

In the implementation process, the RADEC learning model requires students to learn independently through questions or pre-learning assignments given by the lecturer to students. In the pre-learning stage, students are given questions via the WhatsApp group and asked students to read the material to answer the questions. This has a positive impact on improving students' communication skills in discussions and making presentations.

Communication skills in higher education, defined as oral and written communication skills that align with professional, academic, and community

standards" (Ardoukis & Kelly, 2016). Meanwhile, according to Gioiosa & Kinkela (2019), communication skills are the qualities needed to achieve goals which include personal and interpersonal qualities as well as social abilities. a person's skills in expressing messages and understanding messages conveyed by other people as a form of social interaction. This skill is very necessary in building good relationships with the people around us.

Communication skills are very important for students to train and possess in college. A recent movement on college campuses is "cross-curriculum communication." This means that communication skills are now taught in a variety of general education courses, not just those offered by the communications department. Standardized assessments in general education are critical in higher education, and programs in communication disciplines are called upon to lead institutions in efforts to improve communication skills across the curriculum.As such, assessment of communication skills provides a good case study for those interested in the specific assessment of other skills acquired in general education (Dunbar,2006) Some individuals are born with the ability to communicate; but others require more effort to make it feasible (Al-Alawneh, et al., 2019). So communication skills need to be trained and developed, one of which is by using the RADEC learning model.

Conclusion

Communication skills are a very important skill for university students to have to support their future careers in meeting the demands of the world of work. The learning model applied in higher education in order to improve communication skills is the RADEC learning model. This learning model has been proven to be able to train and develop the oral communication skills of elementary school teacher education students.

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