UJME 10 (3) 2021: 194-200
UNNES JOURNAL OF MATHEMATICS EDUCATION
https://journal.unnes.ac.id/sju/index.php/ujme/
ISSN: 2252-6927 (print); 2460-5840 (online)

The effectiveness of the CTL learning model using REACT strategy with the mind map and the influence of learning independence on students' mathematical connection ability

(A Study at TNT School, HCMC, Vietnam)

Khomsatun Dwi Nurhayati[a,*], YL Sukestiyarno[a], Mulyono[a,b]

[a]*Pendidikan Matematika Universitas Negeri Semarang,Indonesia*
**E-mail address: khomsatundn52@students.unnes.ac.id*

ARTICLE INFO

Article history:
Received 4 Oktober 2021
Received in revised form 26 Oktober 2021
Published 30 November 2021

Keywords:
CTL;
REACT;
Mind map;
Learning independence;
Mathematical connection.

Abstract

This study aims to determine the effectiveness of the CTL learning model using REACT Strategy with the mind map and the influence of learning independence on students' mathematical connection abilities. The research was conducted at Tran Nhan Tong Senior High School, Ho Chi Minh City, Vietnam. The research sample were students of class XA1 as the experimental class that applied the CTL learning model using REACT strategy with mind map and class XA2 as the control class that applied the expository learning model selected based on cluster random sampling. The research data were obtained through tests, questionnaires, and observations. The results showed that 1) the mathematical connection ability of the students that use CTL with the mind map-assisted REACT strategy reached the completeness criteria, 2) the mathematical connection ability of students that use CTL with mind map-assisted REACT strategy higher than the mathematical connection ability of students that use expository learning, and 3) there is a positive effect of student learning independence on the mathematical connection ability of students that use CTL with mind map-assisted REACT strategy.

1. Introduction

Vietnam is an ASEAN member country with the capital city of Hanoi. This country has an area of 332,968 m2 with a topography consisting of hills, mountains, dense forests. More than half of Vietnam's indigenous population, the majority of whom are ethnic Kinh, reside in remote parts of the country. Although according to the World Bank's version (Secretariat, 2014) this country is classified as poor economically. The government's commitment to advancing the education of its people is very high, this can be seen in several strategic policies of the government, one of which is the 10-year learning policy. The 2005 Vietnam Law also supports this policy by emphasizing that every citizen, regardless of their ethnic background, religion/belief, gender, socio-economic status, has the same opportunities and opportunities to obtain educational services.

Vietnam's success in education was evident when the country was successful in reaping Mathematical Achievements at the PISA (Program International Student Assessment) event in 2012, which was ranked the second-highest in Southeast Asia after Singapore (Development, 2016). Vietnam's score on PISA 2015 was 495 for Mathematics, and a score of 525 in science, better than the OECD average score of 493. In the field of reading ability, Vietnam earned a score of 487 from the OECD average score of 493. Vietnam's achievement at the 2015 PISA shows that Vietnamese students have sufficient abilities in mastering basic mathematics. This achievement has made the Vietnamese Government even more enthusiastic about making policies to improve the quality of education.

To cite this article:
Nurhayati, K.D, Sukestiyarno, YL &Mulyono, M (2021).The Effectiveness of the CTL Learning Model Using REACT Strategy with the Mind Map and the Influence of Learning Independence on Students' Mathematical Connection Ability (A Study at in TNT School, HCMC, Vietnam).*Unnes Journal of Mathematics Education*, *10*(3), 194-200. DOI: 10.15294/ujme.v10i3.53634

Meanwhile, mathematics is a universal science that underlies modern technology and has an important role in various disciplines. Mathematics is also arranged in a structured, logical, and systematic manner, starting from the simplest concepts to the most complex ones. Apart from that, mathematics has also been regarded as the king of all sciences, and at the same time the servant of other sciences. To understand mathematics, there are several minimum abilities that students must have, which are known as basic abilities. The basic abilities of mathematics according to Martin (2000) include 1) problem-solving skills, 2) reasoning skills, 3) communication skills, 4) connection skills, 5) representation skills. Among the basic abilities above, the most important thing to have is the mathematical connection ability. Mathematical connection ability is needed because mathematics is not divided into various separate topics, but is one unit. Besides, apart from being a field of science, mathematics cannot be separated from the various problems that occur in everyday life.

The PISA results and NCTM Basic Ability are considered to be correlated with students' basic mathematical abilities. This is following the theme of PISA 2015, namely Mathematical Literacy, where mathematical abilities require individuals to be able to formulate, use and interpret them in various contexts. One of the mathematical literacy skills is the ability to connect various mathematical concepts, including procedures, facts, and tools to describe, explain and predict phenomena.

Based on UNESCO's observations, the learning system in Vietnam has not emphasized the soft skills of students but still focus only on material (Tran & Stoilescu, 2016). The majority of applied learning also tends to teacher-centered learning which affects learning independence. The results of an interview with a Mathematics teacher at Tran Nhan Tong, Ho Chi Minh, Vietnam, revealed that students have not been able to use learning materials to solve various problems in real life. Learning in this school is still teacher-centered with the learning strategy of expository. The results of the interview also revealed the fact that trigonometry is one of the materials that are less attractive to students. Even though trigonometry is a material that often appears in every national final exam and college entrance selection. This information raises the suspicion that the mathematical connection skills and learning independence of students in these schools are not good enough so that a certain solution is needed. Models, strategies, and learning media have an important role in determining the success of learning, especially in achieving optimal mathematical connection skills. The appropriate learning model to improve mathematical connection skills should actually be able to train students to: 1) link one mathematical material/topic to another material/topic, 2) link between scientific disciplines, and 3) link material with problems in the environment (Hendriana et al., 2014; Prastiwi et al., 2014; Saminanto, 2015; Ratnawati et al., 2016; Mahendra & Mulyono, 2017; Siregar & Surya, 2017).

CTL model directs students to learning process based on the experiences and daily contexts that students have and linked to concept of material in class, then allows students to relate and implement the concepts in everyday life (Berns & Erickson, 2001; Sihono, 2004; Pramitasari et al., 2011; Rahmadonna, 2011; Tambelu, 2013; Nilasari et al., 2016; Yildiz & Baltaci, 2016; Selvianiresa & Prabawanto, 2017). Based on Crawford (2001), the obstacles faced when using the CTL learning model are that it takes time, additional preparation, and extra hard work. In other words, teachers are required to devote additional time and energy to trying different strategies when they face obstacles and difficulties. The strategy that can be used and which is in accordance with the syntax of the CTL learning model according to Crawford (2001) is the REACT learning strategy.

The term REACT here stands for a number of concepts, namely relating, experiencing, applying, cooperating, and transferring. The concept of relating means that this learning strategy links the material being studied with the context of real-life experiences or previous knowledge; the concept of experiencing is learning that makes students get a learning experience; the concept of applying is learning by applying the concepts that have been learned to use, by providing realistic and relevant exercises; the concept of cooperating is learning by conditioning students to work together, share, respond and connect with other learners; then transferring is learning that encourages students to learn to use the knowledge they have learned into new situations that have not been learned (Crawford, 2001; Sukmana & Wahyudin, 2011; Kaselin et al., 2013; Özbay & Kayaoglu, 2015; Utami, 2016; Yildiz & Baltaci, 2016). Through the stages of the REACT Strategy, it is hoped that students will be able to link mathematical ideas with problems related to real life.

One of the internal factors that influence basic mathematical abilities, especially connection skills, is one's learning independence. Learning independence is an attitude that directs students to carry out their

own activities without the help and intervention of others(Hidayati & Listyani, 2010; Susilo & Kharisudin, 2010; Suardana, 2012; Nahdi, 2017). Learning independence can be achieved with the help of appropriate learning tools or media, making it easier for students to understand mathematical concepts, one of which is with the help of a mind map.

Mind map is apart from being a great route map for memory, also makes it possible to organize facts and thoughts in such a way that the natural workings of the brain are involved from the start (Buzan, 2006; Azman & Tee, 2014; L. M. Puspita et al., 2014; Ratnawati et al., 2016; Karim, 2016; Maharani, 2016; Priantini et al., 2016; L. Puspita et al., 2017). Mind maps can facilitate the learning process in various ways, namely (1) attracting attention and fun, (2) being structured and providing understanding, and (3) focusing on the mind (Buzan, 2006; Sari & Afgani, 2008).

This study applies CTL model with a mind map and REACT strategy on trigonometry material for class X SMA to improve students' mathematical connection skills. The research scenario begins with the initial assignment of students to study material related to trigonometry. Next, students connect the concepts they already have with problems about trigonometry. Then by using student worksheet, students make invention and use the findings. At the final stage of the research, discussions were held to share knowledge.

This study is focused on knowing:

1. Does the mathematical connection ability of students that use CTL with the mind map-assisted REACT strategy achieve the Minimum Completeness Criteria?
2. Does the mathematical connection ability of students that use CTL with mind map-assisted REACT strategy higher than the mathematical connection ability of students that use expository learning?
3. Is there an positif effect of student learning independence on the mathematical connection ability of students that use CTL with mind map-assisted REACT strategy?

The three points above are the focus as well as the formulation of the problem in this study.

2. Methods

This type of study is quantitative research carried out through experimental activities using two independent variables, namely: learning models (X1) and learning independence (X2) and one dependent variable (Y), namely the ability of mathematical connections. This research design is a Quasy Experiment Design in the form of Post-test Only Control Design.

The study population was all students of class X at Tran Nhan Tong School, Ho Chi Minh City, Vietnam. While the sample consists of two classes, namely XA1 as the experimental class and XA2 as the control class. Both classes were selected using the cluster random sampling technique. In the experimental class, the CTL learning model is applied with the REACT strategy assisted by mind map while for the control class the expository learning model is applied.

The data was collected by using the mathematical connection ability test questions in the form of essays. Meanwhile, to determine the learning independence of the sample, a questionnaire and observation were used. The data analysis was carried out on the post-test value data to determine the criteria for minimum completeness, classical completeness, and differences in mathematical connection abilities between the two classes, as well as the effect of independent learning on students' mathematical connection abilities. Data analysis will also examine individual completeness, classical completeness, test differences in connection ability through regression analysis, including the effect of independent learning on students' mathematical connection abilities.

3. Results & Discussions

Data analysis was carried out on the posttest value data to determine the minimum completeness criteria, classical completeness criteria, and differences in mathematical connection abilities between the two classes.

The individual completeness test is carried out using the t-test of one party, namely the right side with the test criteria is reject H_0 if $t_{count} \geq t_{table}$. The results of the calculation show $t_{count} = 6{,}2 > t_{table} = 1{,}7$ so that H_0 is rejected and it is concluded that the average mathematical connection ability of the experimental class students reaches the individual completeness criteria, namely 71. The following is a picture of the percentage level of completeness.

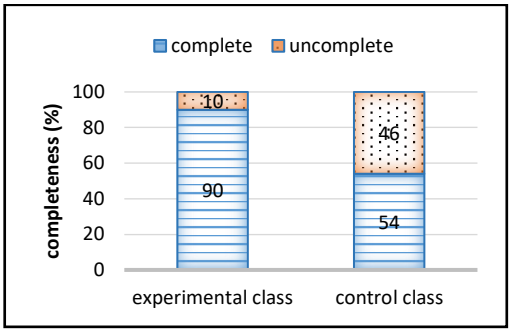

Figure 1. Completeness percentage.

The classical mastery test was carried out to determine the percentage of learning completeness in the experimental class at the 75% achievement point. This test uses the one-party proportion test, namely the right side with the criteria of the reject test H_0 if the value of $z_{count} \geq z_{(0,5-\alpha)}$. Based on the calculation results, it is known that $z_{count} = 1{,}875 > z_{table} = 0{,}1736$ so that H_0 is rejected. So the proportion of completeness of the experimental class is more than 75%.

The difference in the ability of the mathematical connection between the two classes was tested using the comparative test of two independent samples. With the help of SPSS, researchers used the Independent Sample Test and the test criteria were rejected H_0 if the sig value was <5%. The results obtained show the value of sig = 0.005 < α = 5% so that H_0 is rejected and it is concluded that the average connection ability of the two classes is different. This difference can be seen in the following figure.

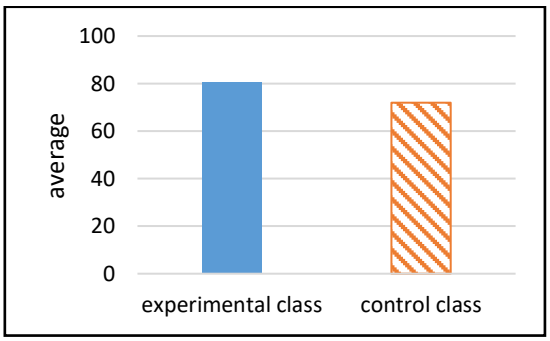

Figure 2. The rates of mathematic connection ability

From Figure 2 it can be seen that the average mathematical connection ability of the experimental class students is higher than the average mathematical connection ability of students in the control class.

Test the effect of independent learning on the mathematical connection ability using a simple regression analysis test. With the help of IBM SPSS Statistics 24, the test criteria accept H_0 if $Sig > 5\%$ in the ANOVA table. The results obtained show the value of sig. value = 0.000 <5%, which means that H_1 is accepted. The results of the regression equation can be seen in the following:

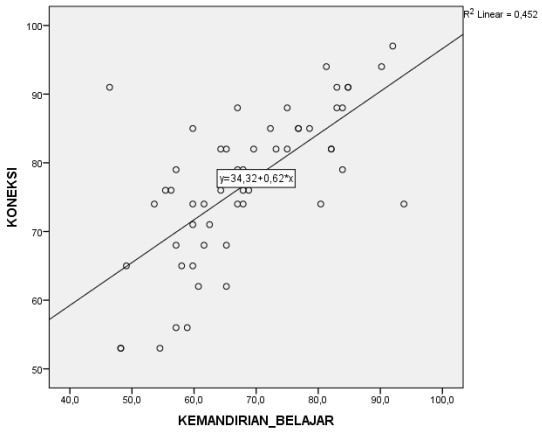

Figure 3. Regression analysis and its equation graph

The learning activities in this study answer the three proposed hypotheses.

a. First hypothesis

Classical completeness was tested using the one-party t-test, namely, the right side stated that the proportion of completeness of the experimental class is more than 75%.

b. Second hypothesis

The difference in the average ability of the mathematical connection between the experimental class and the control class is known using the help of SPSS, the Independent Sample Test with the reject criteria H_0 if the sig value is <5%. Based on the calculation results, the sig value $= 0{,}005 < \alpha = 5\%$ is obtained so that H_0 is rejected. The conclusion is that the average mathematical connection ability of students in the experimental class is higher than average mathematical connection ability of students in the control class.

To find out whether there is an effect of the learning process using the CTL model with the mind map-assisted REACT strategy, the following steps are taken:

- Relating
  At this stage, students are invited to connect the concept of triangles and angles and then relate them to trigonometry. At this stage, students write down the questions that arise regarding the relationship between the two concepts.
- Experiencing
  At this stage, students are invited to solve math problems that exist in everyday life through scientific experience gained. For example, students are invited to measure the angle of the school stairs to determine the height or distance between the ground floor and the second floor.
- Applying
  At this stage, students learn to apply their knowledge through question practice. For example, students are asked to determine the height of the flagpole or the height of the building.
- Cooperating
  In the cooperating stage, students are invited to collaborate with friends to hone their mathematical connection skills.
- Transferring
  At this stage, students share their knowledge with other students. This is reflected in the discussion and question-and-answer activities. In addition, students summarize ideas and findings from the previous steps into a mind map.

Apart from testing the 2 hypotheses above, testing is also carried out on the thrid hypothesis, which is to see the relationship between independent learning (X) and mathematical connection ability (Y). Based on the simple regression analysis test, the results of the regression equation are Y= 34.324 + 0.623X which means H_1 is accepted. In other words, the higher the student's learning independence will result in a high mathematical connection ability. Thus it can be concluded that independent learning has a positive effect on the ability of mathematical connections.

The simple regression analysis test also obtained the coefficient of determination $R^2 = 0.452$ as shown in Figure 3. This value indicates that the student learning independence variable affects the student's

mathematical connection ability variable by 45.2%. In other words, there are still 54.8% of variables other than independent learning that also affect the student's mathematical connection ability variable.

4. Conclusion

Based on the discussion and analysis of the research data, it can be concluded that:

1. The mathematical connection ability of the students that use CTL with the mind map-assisted REACT strategy reached the completeness criteria.
2. The mathematical connection ability of students that use CTL with mind map-assisted REACT strategy higher than the mathematical connection ability of students that use expository learning.
3. There is an positif effect of student learning independence on the mathematical connection ability of students that use CTL with mind map-assisted REACT strategy.

References

Azman, T. K., & Tee, M. N. A. (2014). Buzan Mind Mapping: An Efficient Technique for Note-Taking. *International Journal of Social, Management, Economics, and Bussines Engineering*, *8*(1), 18–22.

Berns, R. G., & Erickson, P. M. (2001). *Contextual teaching and learning: Preparing students for the new economy* (Vol. 5). Citeseer.

Buzan, T. (2006). Mind Map Untuk Meningkatkan Kreativitas (How to Mind Map). *Jakarta: PT Gramedia Pustaka Utama*.

Crawford, M. L. (2001). Teaching contextually. *Research, Rationale, and Techniques for Improving Student Motivation and Achievement in Mathematics and Science. Texas: Cord*.

Development, O. for E. C. and. (2016). PISA 2015 results in focus. *PISA*.

Hendriana, H., Slamet, U. R., & Sumarmo, U. (2014). Mathematical connection ability and self-confidence (an experiment on junior high school students through contextual teaching and learning with mathematical manipulative). *International Journal of Education*, *8*(1), 1–11.

Hidayati, K., & Listyani, E. (2010). Pengembangan Instrumen Kemandirian Belajar Mahasiswa. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *14*(1).

Karim, A. (2016). Mengembangkan Berfikir Kreatif Melalui Membaca dengan Model Mind Map. *LIBRARIA: Jurnal Perpustakaan*, *2*(1).

Kaselin, K., Sukestiyarno, S., & Waluya, B. (2013). Kemampuan komunikasi matematis pada pembelajaran matematika dengan strategi REACT berbasis etnomatematika. *Unnes Journal of Mathematics Education Research*, *2*(2).

Maharani, A. (2016). Meningkatkan Kreativitas Matematis Siswa Melalui Pembelajaran Peta Pikiran. *UJMES (Uninus Journal of Mathematics Education and Science)*, *1*(2), 11–16.

Mahendra, N. R., & Mulyono, M. (2017). Analisis Kemampuan Koneksi Matematis Siswa SMA Ditinjau dari Gaya Kognitif pada Model PBL. *PRISMA, Prosiding Seminar Nasional Matematika*, 62–71.

Martin, W. G. (2000). *Principles and standards for school mathematics* (Vol. 1). National Council of Teachers of.

Nahdi, D. S. (2017). Self regulated learning sebagai karakter dalam pembelajaran matematika. *Jurnal THEOREMS (The Original Research of Mathematics)*, *2*(1).

Nilasari, E., Djatmika, E. T., & Santoso, A. (2016). Pengaruh penggunaan modul pembelajaran kontekstual terhadap hasil belajar siswa kelas V Sekolah Dasar. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *1*(7), 1399–1404.

Özbay, A. S., & Kayaoglu, M. N. (2015). The use of REACT strategy for the incorporation of the context of physics into the teaching English to the physics English prep students. *Journal of History Culture and Art Research*, *4*(3), 91–117.

Pramitasari, A., Indriana, Y., & Ariati, J. (2011). Hubungan Antara Persepsi Terhadap Metode Pembelajaran Kontekstual Dengan Motivasi Belajar Biologi Siswa Kelas XI IPA SMAN 1 Pangkalan Kerinci, Riau. *Jurnal Psikologi Undip*, *9*(1).

Prastiwi, I., Soedjoko, E., & Mulyono, M. (2014). Efektivitas Pembelajaran Conceptual Understanding Procedures Untuk Meningkatkan Kemampuan Siswa Pada Aspek Koneksi Matematika. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *5*(1), 41–47.

Priantini, D. A. M. M. O., Atmadja, N. B., & Marhaeni, A. (2016). *Pengaruh Metode Mind Mapping Terhadap Keterampilan Berpikir Kreatif Dan Prestasi Belajar IPS*. Ganesha University of Education.

Puspita, L. M., Sudarisman, S. M., & Maridi, M. (2014). Pengaruh Model Problem Based Learning Dengan Metode Eksperimen Disertai Teknik Concept Map Dan Mind Map Terhadap Prestasi Belajar Biologi Ditinjau Dari Motivasi Belajar Dan Aktivitas Belajar Siswa. *Inkuiri*, *3*(01).

Puspita, L., Yetri, Y., & Novianti, R. (2017). Pengaruh Model Pembelajaran Reciprocal Teaching Dengan Teknik Mind Mapping Terhadap Kemampuan Metakognisi Dan Afektif Pada Konsep Sistem Sirkulasi Kelas Xi Ipa Di Sma Negeri 15 Bandar Lampung. *Biosfer: Jurnal Tadris Biologi*, *8*(1), 78–90.

Rahmadonna, S. (2011). Penerapan Pembelajaran Kontekstual pada Mata Pelajaran Matematika untuk Meningkatkan Motivasi Belajar Siswa SMA. *Majalah Ilmiah Pembelajaran*, *7*(1).

Ratnawati, I. D., Hidayah, I., & WIjayanti, K. (2016). Keefektifan Pembelajaran Matematika Model Learning Cycle 5e Berbantuan Media Mind Mapping Terhadap Kemampuan Koneksi Matematik dan Kerjasama. *PRISMA, Prosiding Seminar Nasional Matematika*, 733–755.

Saminanto, K. (2015). Analysis of mathematical connection ability in linear equation with one variable based on connectivity theory. *International Journal of Education and Research*, *3*(4), 259–270.

Sari, A., & Afgani, J. (2008). Pengaruh pemberian tugas creative mind map setelah pembelajaran terhadap kemampuan kreativitas dan koneksi matematik siswa. *Prosiding Seminar Matematika. Yogyakarta: Uny*.

Secretariat, A. (2014). ASEAN state of education report 2013. *ASEAN Secretariat, Jakarta, Indonesia*.

Selvianiresa, D., & Prabawanto, S. (2017). Contextual teaching and learning approach of mathematics in primary schools. *Journal of Physics: Conference Series*, *895*(1), 012171.

Sihono, T. (2004). Contextual Teaching and Learning (CTL) sebagai model pembelajaran ekonomi dalam KBK. *Jurnal Ekonomi Dan Pendidikan*, *1*(1).

Siregar, N. D., & Surya, E. (2017). Analysis of students' junior high school mathematical connection ability. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *33*(2), 309–320.

Suardana, I. K. (2012). Implementasi Model Belajar Mandiri untuk Meningkatkan Aktivitas, Hasil, dan Kemandirian Belajar Mahasiswa. *Jurnal Pendidikan Dan Pengajaran*, *45*(1).

Sukmana, A., & Wahyudin, W. (2011). A TEACHING MATERIAL DEVELOPMENT FOR DEVELOPING STUDENTS'INTUITIVE THINKING THROUGH REACT CONTEXTUAL TEACHING APPROACH. *Jurnal Mat Stat*, *11*(02).

Susilo, B. E., & Kharisudin, I. (2010). IMPROVING THE AUTODIDACT LEARNING OF STUDENT ON KALKULUS THROUGH COOPERATIVE LEARNING "STUDENT TEAMS ACHIEVEMENT DIVISION" BY PORTFOLIO PROGRAMMED. *Jurnal Penelitian Pendidikan*, *27*(1).

Tambelu, J. V. (2013). Development of mathematical learning based contextual model in south minahasa regency. *Development*, *4*(15).

Tran, T. M., & Stoilescu, D. (2016). An Analysis of the Content, Policies and Assessment of ICT Curricula in the Final Years of Secondary Schooling in Australia and Vietnam: A Comparative Educational Study. *Journal of Information Technology Education*, *15*.

Utami, W. S. (2016). React (Relating, Experiencing, Applying, Cooperative, Transferring) Strategy to Develop Geography Skills. *Journal of Education and Practice*, *7*(17), 100–104.

Yildiz, A., & Baltaci, S. (2016). Reflections from the Analytic Geometry Courses Based on Contextual Teaching and Learning through GeoGebra Software. *Online Submission*, *6*(4), 155–166.