

Analysis of generic science skills in prospective biology teacher students

by

Rinandita Wikansari , Suhardi
Napid , **J. Junaidi** , Wahyu Ari
Andryanto , S. Susilo,



ISSN: 2008-6822 (electronic)



International Journal of Nonlinear Analysis and Applications

Editor-in-Chief

Madjid Eshaghi Gordji

Co-Editor-in-Chief

Ali Jabbari

Managing Editor

Mohammad Rasoul Velayati

Scientometric Editor

Rahman Marefat

Technical Editor

Javad Damirechi

Editorial Board

Mahmoud Filali

Asadollah Aghajani

Haydar Akca

Mugur Alexandru Acu

Gholamreza Askari

Abasalt Bodaghi

Mohammad Bagher Ghaemi

Ehsan Kozegar

Anthony To Ming Lau

Oluwatosin Tope Mewomo

Choonkil Park

Michael Th. Rassias

Abdolrahman Razani

Reza Saadati

Seyed Hossein Siadati

Seyed Mansour Vaezpour

Javad Vahidi

Ali Farajzadeh

Mouquan Shen

Zakieh Avazzadeh

Nallappan Gunasekaran

Seyyed Mohammad Reza Hashemi

Available electronically at

<https://ijnaa.semnan.ac.ir/>



Articles in Press

Current Issue

Journal Archive

Volume 14 (2023)

Volume 13 (2022)

Volume 12 (2021)

Volume 11 (2020)

Volume 10 (2019)

Volume 9 (2018)

Volume 8 (2017)

Volume 7 (2016)

Volume 6 (2015)

Volume 5 (2014)

Volume 4 (2013)

The International Journal of Nonlinear Analysis and Applications (IJNAA), a publication of Semnan University in English is an international Double-Blind peer-reviewed journal. IJNAA is partially sponsored by Semnan University. The International Journal of Nonlinear Analysis and Applications publish papers that treat **nonlinear mathematical analysis** and its numerous applications. The journal welcomes the mathematical questions arising in physics, chemistry, biology, engineering, economics etc.

Research Areas Include:

- New developments in nonlinear analysis
- Significant applications of nonlinear analysis, including those to other areas of sciences
- Mathematical physics
- Control and optimization
 - Differential and partial differential equations
- Fixed point theory
- Complex analysis
- Numerical analysis
- Probability and Combinatorics

and other areas that have connections with nonlinear analysis.

The International Journal of Nonlinear Analysis and Applications (IJNAA) is an open-access publication i.e. all published papers are freely available online without any restrictions or any other subscriptions to researchers worldwide. The International Journal of Nonlinear Analysis and Applications (IJNAA) is using Editorial Tracking System for the quality review process. Editorial Tracking System is an online manuscript submission, review and tracking system. Review processing is performed by the editorial board members of IJNAA.

Important notice for Iranian authors: Starting from **August 21, 2023**, all submitted articles from this date with **Iranian corresponding authors** must pay a publication fee of 6,000,000 Rials (equivalent to \$12) to the Semnan University account after their article has been accepted for publication.

Publication Information

Publisher
Semnan University

Editor-in-Chief
Madjid Eshaghi Gordji

Co-Editor-in-Chief
Ali Jabbari

Managing Editor
Mohammad Rasoul Velayati
Haider Falah Zaeid Alkhafaji
Javad Damirchi

Technical Editor
Javad Damirchi

Scientometric Editor
Rahman Marefat

Editorial Board
Anthony To Ming Lau
Saeid Abbasbandy
Choonkil Park
Haydar Akca
Michael Th. Rassias
Mugur Alexandru Acu
Mohammad Bagher Ghaemi
Ali Ebadian
Saman Babaie-Kafaki
Mahmoud Filali
Oluwatosin Tope Mewomo
Seyed Hossein Siadati

Volume 3 (2012) ▼	
Volume 2 (2011) ▼	
Volume 1 (2010) ▼	
Number of Volumes	14
Number of Issues	37
Number of Articles	2,423
Number of Contributors	5,070
Article View	933,477
PDF Download	1,316,683
View Per Article	385.26
PDF Download Per Article	543.41

IJNAA is Abstracted, Reviewed and Indexed in:
SJR, ISC Master Journals and many other databases.

Most Cited Articles

- H. Khodaei and T. Rassias, Approximately generalized additive functions in several variables
- P. Gavruta, L. Gavruta, A new method for the generalized Hyers-Ulam-Rassias stability
- R. Farohkzad Rostami, S.A.R. Hosseinioun, Perturbations of Jordan higher derivations in Banach ternary algebras: an alternative fixed point approach
- C. Patk, A. Najati, Generalized additive functional inequalities in Banach algebras
- C. Park, T.M. Rassias, Isomorphisms in unital C*-algebras

Most Visited Articles

- An inequality related to η -convex functions (II)
- A new deep learning model to reduce Covid19-based face mask detection
- Brain tumor segmentation and classification: A one-decade review
- Generalization of Darbo's fixed point theorem and application
- On the maximal ideal space of extended polynomial and rational uniform algebras

Seyed Mansour
Vaezpour
Shahram Saeidi
Reza Saadati
Abdolrahman Razani
Javad Vahidi
Ali Gaffari
Abasalt Bodaghi
Ali Farajzadeh
Mouquan Shen
Zakieh Avazzadeh
Ehsan Kozegar
Sirous Moradi
Farshid Khojasteh
Asadollah Aghajani
Nallappan
Gunasekaran
Seyyed Mohammad
Reza Hashemi

Advisory Board



Palle Jorgensen
Nail H. Ibragimov

Honorary Editor

Sever Silvestru
Dragomir
Stevo Stević
Ravi P. Agarwal
Manuel de la Sen
Endre Pap
Martin Bohner
Hari Mohan
Srivastava

Past Editorial Board

Milutin Obradovic
Daniel Breaz
Hark-Mahn Kim
Yasuo Narukawa

 Frequency	Monthly
 Online ISSN	2008-6822

 **Indexing and Abstracting** ▲

 **AMS** AMERICAN MATHEMATICAL SOCIETY
Advancing research. Creating connections.

...

Reviewers

Peer reviewers are essential in order to obtain a high quality journal.

We would like to thank the following reviewers who have taken part in the peer-review process for International Journal of Nonlinear Analysis and Applications (IJNAA).

- Asadillah Aghajani
- Mohsen Alimohammadi
- Hamid Baghani
- Alireza Bahiraei
- Abasalt Bodaghi
- Janusz Brzdek
- Yeol Je Cho
- Javad Damirchi
- Ali Davari
- Ali Ebadian
- Raziye Farrokhzad Rostami
- Mohammad Bagher Ghaemi
- Bahman Hayati
- Seyed Alireza Hosseinioun
- Gwang Hui Kim
- Hark Mahn Kim
- Saman Babaei Kafei
- Hamid Khodaei
- Reza Memarbashi
- Madjid Mirzavaziri
- Alireza Moazzen
- Kazem Nouri
- Choonkil Park
- Mohsen Rabbani
- Stojan Radenovic
- Maryam Ramezani
- John Rassias
- Themistocles Rassias
- Abdolrahman Razani
- Reza Saadati
- Ghadir Sadeghi

- Shahram Saeidi
 - Saeid Shams
 - Mihai Turinici
 - Ahmadreza Yazdanian
-

Indexing and Abstracting



Mathematical Reviews® (AMS)



Zentrablatt Math.



publons



SCImago



ISC Master Journals



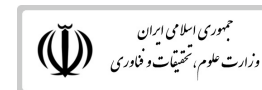
Google Scholar



RICeST



SIS



MSRT



ROAD



Researchgate



Magiran



ISRAJIF



ABCD Index



Analysis of generic science skills in prospective biology teacher students

Rinandita Wikansari^a, Suhardi Napid^b, J. Junaidi^b, Wahyu Ari Andryanto^c, S. Susilo^{d,*}

^aInternational Trade for ASEAN and China Region, Politeknik APP Jakarta, Indonesia

^b Department of Mechanical Engineering, Faculty of Engineering Universitas Islam Sumatera Utara, Indonesia

^c UPN Veteran Jakarta, Jakarta, Indonesia

^dDepartment of Biology Education, Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta Timur, Indonesia

(Communicated by Madjid Eshaghi Gordji)

Abstract

The learning process of blood coagulation practicum for circulatory system material in Biology Education students aims to determine the ability of generic science skills. Descriptive method used in this study with research subjects consisted of 58 6th semester students. Data were obtained using essay tests. Achievement of generic science skills in students is focused on five aspects of generic science skills with research results that show, direct observation 98.83% (very good), symbolic language 38.79% (very poor), modeling 90.95% (very good), logical inference 39.51 % (very little), logic framework 94.90% (very very), with an overall average yield (75.6%) in the medium category. this generic science ability is still needed intensive guidance to increase shn for prospective teacher students biology.

Keywords: Generic Science Skills; Blood Coagulation, Candidate Teacher.

1. Introduction

In 2016 the UNESCO data in Global Education Monitoring (GEM) noted that education in Indonesia was ranked 10th out of 14 developing countries, and educators or teachers ranked last out of 14 developing countries. This data is of concern to the world of education in Indonesia in dealing with these problems.

At least there are a few points that need to be examined in the world of education namely the matter of how to prepare a quality generation. To create a professional teacher Education Institutions

*Corresponding author

Email address: susilo@uhamka.ac.id (S. Susilo)

Education Personnel (LPTK) should be done from the bottom, so that the readiness of a prospective educator in teaching students to be mature, and have basic skills to make learning better.

Professional teachers are teachers who have expertise, responsibility and have sufficient competence such as spiritual, intellectual, social, personal, and moral competence (Surya, 2003). Fadel and Trilling [3] revealed that teachers must always be in progress with the times so that the paradigm shift is conventional towards the modern age, so that learning from the teacher's center leads to students. One way to overcome errors in the absorption of information knowledge, the skills intended in this case are generic skills.

Generic or basic skills are also known as core skills. Generic skills include communication, teamwork, problem solving, initiative and enterprise, planning and organizing, self-management, learning skills, and technology skills (Agustina, Muslim, & Taufik, 2012).

Generic skills according to the view of Sarkar et al., [10] that these skills need to be assessed exclusively by values, because students tend to only take things seriously related to their interests. Generic skills in learning, especially science learning, students are expected to have it and be able to apply it in everyday life. The application cannot be fulfilled if the basic capabilities have not been formed. This is according to Bailey's statement; Saptorini (2008); Rosidah, et.al. [9] that the basic ability is the generic ability of science.

According to Sudarmin [11] generic science skills are the ability to think and act in accordance with the scientific knowledge that is owned where these skills are closely related to scientific attitudes derived from scientific process skills in general. These skills must be possessed by students because generic science skills are general and oriented towards higher science [13]. There are several components in the generic skills of science namely direct observation, indirect observation, awareness of scale, symbolic language, logical form logical consistency, causal law, modeling, logic inference, abstraction [11].

Generic skills cannot be obtained instantly but through a continuous process so that they develop. Therefore, according to generic science skills [13] is a skill that can be used globally in scientific work activities and can be used as a basis for conducting scientific activities, one of which is practicum.

Practicum is a practical activity carried out in the laboratory and outside the laboratory to achieve learning objectives [5]. According to [6] practicum is one of the activities that must be applied to lecture activities for prospective biology teacher students. Practicum is one of the ideal vehicles to bring students to the real approach of a natural phenomenon and this process can practice generic science skills (Agustina Ningsih, Suparmi, 2014).

Research conducted by Rahman et. al., [8] in the planning of practical learning based on generic abilities has a positive impact (81.4) and based on research [6] data analysis observations obtained moderate KGS (71.57%). This makes researchers want to make in-depth observations related to the generic skills of students through practicum activities because, it is still rare to research related to biology practicum learning.

In line with previous studies, this article focuses on finding out the generic abilities of science students in Biology Education through blood coagulation practicum in animal physiology practicum courses.

2. Methods

In this study using descriptive methods collected from 7 items of essay on the material circulation system of blood coagulation practicum by covering five aspects of indicators namely direct observation, modeling, symbolic language, logic inference, logic framework.

This research was conducted at the University of Muhammadiyah Prof. Dr. Hamka Faculty of Teacher Training and Education in Biology Education Study Program with the time of the study was conducted on 1-30 April 2019. The sample used was 58 students of 2016, with saturated sampling technique.

3. Research Procedure

The research procedures carried out are divided into three stages, the initial stage, the implementation stage, and the final stage. The initial stage is to study literature and information about the generic science of students on blood coagulation practicum, conduct the preparation of instruments, request permission from each class leader and lecturer to conduct research in class, carry out instrument testing and after the validity and reliability test of the instrument is carried out.

Furthermore, the implementation phase, after completing the practicum activities, students are given the task to answer questions relating to the blood coagulation practicum and the last at this stage is processing instrument data results.

4. Data Collection and Analysis

Collecting data in the form of 7 item essay test items that have been through the validation process, and reliability. Data analysis was performed with Microsoft Excel software by finding a percentage. Data analysis to determine the percentage of generic science skills in biology students using the following formula:

$$NP = \frac{R}{SM} \times 100\%$$

Information:

- NP = Percent value of generic ability sought
- R = Raw scores obtained by students
- SM = The ideal maximum score for each series
- 100 = Fixed number

5. Result and discussion

This study provides an overview of the assessment of generic science skills in blood coagulation practices, and this study can also accurately identify gaps in the development of generic science skills. The generic science skills of blood coagulation practicum are in the moderate category (75.6%). From the 5 indicators of generic science skills that I examined, we consider that there are two most prominent indicators, namely the direct observation indicator (98.83%) and the symbolic language indicator (38.79%) can be seen in Figure 1.

The generic science skills measured in 6th semester students cover 5 aspects of indicators, namely direct observation, symbolic language, modeling, logic inference, logic framework. The percentage of science generic skills in the blood coagulation practicum from each indicator can be seen in the following figure:

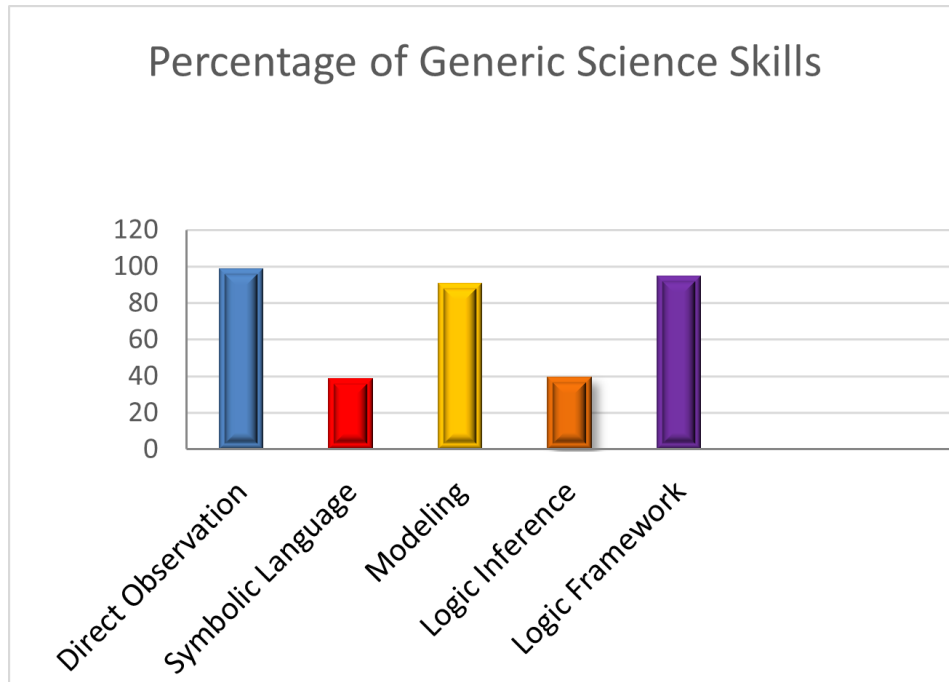


Figure 1: Percentage of generic science skills for each indicator.

Indicators of direct observation in this study reveal the characteristics of objects based on the results of direct sensing. In this indicator the highest percentage achievement is 98.83%. In terms of obtaining data, students are guided to observe changes in blood during the practicum until they become fibrin strands. In our opinion, this indicator is an indicator that is easy to remember and develop by students. This is supported by Brotosiswoyo (2001) Generic skills of direct and indirect observation are easily mastered. Direct observation can also be obtained through daily events or while conducting experiments, so that it is easily mastered by students [11].

The symbolic language in this study is that students are required to explain the symbolic language in the process of blood clotting so that the generic skills of symbolic language emphasize not only remembering but understanding the meaning of the symbol. In research students are able to mention and explain the meaning of the symbolic meaning of the blood coagulation process. The percentage of this indicator is 38.79%, included in the category of very less, this is in our opinion because biology has quite a lot of wealth as a communication tool in the form of symbolic language so that students are less able to understand and interpret the meaning of symbols that occur in the process of blood coagulation. This is supported by [12] Symbolic language generic skills have patterns of difficulty and this is reinforced by [1] which states that the generic skills of symbolic language are quite difficult to develop.

The modeling indicator in this study is to make a table of raw data. In this indicator, students are required to make a table of practicum data. In terms of getting data, students involve cognitive strategies, where students are required to be able to take the tools and materials needed, then students are able to translate practicum procedures. So that the percentage achieved on this indicator through the essay test is 90.95% with excellent category and this indicator is strengthened by research [4] that the results of achieving generic modeling skills in the excellent category.

Inference in indicators of science generation skills can be interpreted as the activity of inferring from the data provided or premises to another example revealed [13]. Generic inference skills in research using explanations or arguments, drawing conclusions, solving problems, so the percentage achieved in this indicator amounted to 39.51%, in our opinion this is because students are required

to solve problems from the concepts that have been collected then associate it into a the basic basis of thinking in solving problems that are difficult to develop. However, research has been done [12] inference is a generic ability whose value can be achieved by students in the medium and according categories [11] Logic inference is an ability that is difficult to develop.

In this logic framework indicator students are emphasized to create or use concept maps. This provides benefits for prospective biology teachers including helping to process concepts in simpler forms, diagnosing what students already know in the form of structures they build in the form of schemes or words [11]. In this indicator a percentage gain of 94.90% was achieved, in our opinion the use of concept maps in the practice of coagulation practice is more meaningful, easy to remember and understand. This is in line with research [12] Logical inference has a positive impact on improving the quality of teaching learning practices for prospective teachers.

6. Conclusion

The Analysis Of Generic Science Skills On Blood Coagulation Practicum Is In The Moderate Category (75.6%) Because Only Some Students Are Actively Involved In The Learning Process Of Practicum. Therefore, In This Skill There Must Be Further In-Depth Studies To Find Out The Generic Skills Of Biology Education Students.

References

- [1] B.S. Brotoiswoyo, *Hakikat Pembelajaran MIPA Fisika Di Perguruan Tinggi*, Proyek Pengembangan Universitas Terbuka Direktorat Jendral Pendidikan Tinggi Jakarta, Depdiknas, 2000.
- [2] B.S. Brotoiswoyo, *Hakikat Pembelajaran MIPA di Perguruan Tinggi*, Jakarta: Universitas Terbuka, 2000.
- [3] C. Fadel and B. Trilling, *21st Century Skills: Learning for Life in Our Times*, Education Review, 2010.
- [4] Gifani and Albi, *Penerapan Pendekatan Saintifik pada Pengembangan Keterampilan Generik Sains Siswa untuk Konsep Tirasi Asam-Basa*, Prosiding SNIPS, 2016.
- [5] L. Lismaya and R. Widiantie, *Penerapan pembelajaran morfologi tumbuhan melalui outdoor activities untuk meningkatkan multiple intellegencies mahasiswa*, Quagga J. Pendidikan Bio. 9(1) (2017).
- [6] Muspiroh, *Analisis kemampuan generik sains mahasiswa calon guru biologi pada praktikum anatomi tumbuhan*, Sci. Educ. J. Pendidikan Sains 1(1) (2012).
- [7] N. Purwanto, *Prinsip-prinsip dan teknik evaluasi pengajaran*, Bandung, Remaja Rosdakarya, 2013.
- [8] T. Rahman, Taufik, N. Rustaman, N. Syaodih and A. Poedjiadi, *Profil Kemampuan Generik Perencanaan Percobaan Calon Guru Hasil Pembelajaran Berbasis Kemampuan Generik Pada Praktikum Fisiologi Tumbuhan*, Educare, 2006.
- [9] T. Rosidah, A.P. Astuti and V.A. Wulandari, *Eksplorasi keterampilan generik sains siswa pada mata pelajaran kimia di SMA negeri 9 Semarang*, J. Pendidikan Sains 5(2) (2017) 130–137.
- [10] M. Sarkar, T. Overton, C.D. Thompson and G. Rayner, *Academics' perspectives of the teaching and development of generic employability skills in science curricula*, Higher Educ. Res. Dev. 39(2) (2020) 346–361.
- [11] D. Sudarmin, *Keterampilan Generik Sains dan Penerapannya Dalam Pembelajaran Kimia Organik*, Semarang: UNNES PRESS, 2012.
- [12] W. Sumarni, *Penerapan learning cycle sebagai upaya meningkatkan keterampilan generik sains inferensia logika mahasiswa melalui perkuliahan praktikum kimia dasar.*, J. Inov. Pendidik. Kim. 4(1) (2009) 521–531.
- [13] M. Taofiq, D. Setiadi and G. Hadiprayitno, *Analisis Implementasi Model Pembelajaran Inkuiri dan Problem Based Learning Terhadap Kemampuan Literasi Sains Biologi Ditinjau Dari Kemampuan Akademik yang Berbeda di SMAN 1 Kayangan*, Prosiding Seminar Nasional Pendidikan Bio. 1(1) (2018) 549–555.