

PAPER • OPEN ACCESS

A conceptual of teaching models inquiry-based social constructivism (IbSC)

To cite this article: R Perdana *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **243** 012110

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

A conceptual of teaching models inquiry-based social constructivism (IbSC)

R Perdana¹, Budiyo², Sajidan², Sukarmin² and I R W Atmojo¹

¹ Doctoral Program, Universitas Sebelas Maret

²Teacher Training and Education Faculty, Universitas Sebelas Maret

ryzalperdana2009@gmail.com

Abstract. This study aims to 1) review the five-stage levels of inquiry learning, 2) describe the relationship of inquiry learning with social constructivism. 3) describe the conceptual models of inquiry-based social constructivism (IbSC) in chemistry learning. The 5-stage levels of inquiry learning recommended by Wenning are observation, manipulation, generalization, verification, application. This research is a qualitative descriptive based on literature from the five-stage levels of inquiry with psychology unsure a social constructivism as an effort to maximize the learning of chemistry. The results show that the five-stage levels of inquiry learning are founded some weaknesses, the learning process is an individualist, the social element is low and collaborative learning is weak, therefore in learning need to exchange information and ideas between an individual in the group and another. Conceptually the weakness of inquiry learning can be minimized through the added element of social constructivism. The syntax of inquiry-based social constructivism (IbSC) model can be formulated into 6 steps consist of observation, peer reconstruction, peer manipulation, generalization, peer verification, and application.

1. Introduction

The 21st-century learning system requires schools to transform teacher-centered learning into student-centered learning [1]. In the 21st century learning through memorization is not appropriate for those who want to understand learning [2]. The organization of learning and assessment of student learning outcomes should change from teacher centered patterns to student-centered patterns [3], because active students will build their own knowledge [4] using their own language [5] will be more effective and long-lasting [6] because it is understood that teachers are not the only source of learning [7]. The learning model that makes student-centered pattern one of them is inquiry learning because inquiry learning model provides students to construct their own knowledge and find meaningful learning independently [5,8,9].

Inquiry learning models provide opportunities for students to develop active learning methods by finding and investigating their own knowledge. This step is done so that students are able to explore the ability to think critically and try to solve their own problems through scientific methods and attitudes. The inquiry model helps practitioners understand important factors and the relationship between activities that are interrelated with learning. The inquiry learning model facilitates students to make them interested in learning. This learning model encourages students to get their own discoveries. In addition, this model has been proven to be able to develop the potential of students both physically and emotionally Inquiry learning models provide opportunities for students to develop active learning methods by finding and investigating their own knowledge. This step is done so that



students are able to explore the ability to think critically and try to solve their own problems through scientific methods and attitudes. The inquiry model helps practitioners understand important factors and the relationship between activities that are interrelated with learning. The inquiry learning model facilitates students to make them interested in learning. This learning model encourages students to get their own discoveries. In addition, this model has been proven to be able to develop the potential of students both physically and emotionally.

The purpose of inquiry learning models to increase curiosity, involve active learning, improves understanding through problem-solving. Development knowledge in finding concepts, experience, thinking skills, intellectual discipline, active participation in every activity of the learning process activities are more productive.

when using student inquiry model also have the opportunity to observe, formulate predictions, collect and analyze data and develop scientific principles [10-14] while the 5-stage degree of inquiry by [9] is derived from 15 years of teaching experience in ilinois state university by formulating the steps as follows:

1. Observation: students observe phenomena that elicit their response to observe in detail what they observe and the main questions to be investigated
2. Manipulation: students make ideas and make plans to collect qualitative and quantitative data and then do what has been planned.
3. Generalization: students build principles that are then clearly explained about the problems they find.
4. Verification: students make predictions and perform tests using the law that comes from the previous stage.
5. Application: students express their conclusions that are independently derived and agreed upon.

In the five steps recommended by Wenning in inquiry learning provide additional time to communicate their group conclusions which will then be agreed upon and applied in learning and daily life. Visible to the 5-stage levels of inquiry there is no step to where students can construct and present their findings in collaboration to then confirm the truth before proceeding to the next step. Because it is necessary psychology elements that can collaborate between individuals so that the mental ability between students who are ready and not ready to use inquiry learning models can be evenly distributed, because it is believed only students who have mental readiness and high knowledge that will be able to obtain learning outcomes maximally using inquiry, this is in accordance with opinion [5,15,16] because the inquiry model is developed with the assumption that students have readiness of mind in learning, so consequently less well-prepared students will have difficulty in learning. [14] recommends giving test levels of inquiry before learning, but at the lowest level of inquiry is discovery learning will result in the same in students who do not have the ability and high mental readiness to use this learning model. This can be overcome by integrating social constructivism psychology elements because according to [17] one's personality can develop by observing one's behavior, this opinion in tune with [18] that social constructivism is the theory that examines the knowledge and understanding of the world developed with other individuals of social interaction, [19] this theory says that understanding and meaning developed in coordination with other humans [20] and sharing among individuals called collaborations [21,22] will be more meaningful in learning.

Inquiry learning model is integrated with social constructivism with the novelty of the model, namely the conceptual inquiry-based social constructivism model (IbSC). The conceptual inquiry -based social constructivism model (IbSC) hopes that students can interact and communicate effectively with other individuals to construct broader knowledge, problem-solving skills, provide opportunities for students to know how far the students understand in studying the lesson. Based on the background above aims to 1) Analyze five stage levels of inquiry learning, 2) Describe the linkages of inquiry learning with social constructivism. 3) Describe the conceptual inquiry-based social constructivism model (IbSC) in chemistry learning.

2. Research Method

The method used in this study is a descriptive analysis with a literature review of the 5-stage levels of inquiry recommended by Wenning is observation, manipulation, generalization, verification, application then looking at the relationship between 5-stage levels of inquiry and elements of psychology of social constructivism recommended by various psychology experts is Syntax, Social system, Principle of reaction, Support system, Instructional and nurture effects. 5-stage levels of inquiry led to Wenning then integrated with the elements of social constructivism psychology and then became a renewal of the conceptual model of inquiry -based social constructivism (IbSC). A conceptual inquiry-based social constructivism model (IbSC) with the steps of of inquiry-based social constructivism (IbSC) model are of inquiry based social constructivism (IbSC) model are observation, peer reconstruction, peer manipulation, generalization, peer verification and application to developing individual thinking through social and collaborative interactions between individuals.

3. Result and Discussion

Based on research conducted on the literature study of the five -stage level of inquiry with social constructivism psychology element it is found that there are some weaknesses of inquiry learning model in chemistry learning process in senior high school, therefore it needed solution to overcome the weakness of one of them with how to integrate the constructivism of social elements in the 5-stage learning step of inquiry that will generate a new model of inquiry-based social constructivism (IbSC) to maximize learning outcomes obtained by the entire student.

3.1. Relationship of the 5-Stage Levels of Inquiry with Social Constructivism

The 5-stage levels of inquiry have observation, manipulation, generalization, verification, application [9] steps from which there are no steps in which students can interact and collaborate with other individuals to construct the knowledge they will gain [23] children develop their thinking skills through interaction with other children and adults, from a psychological point of view it is desperately needed a step that all students can adapt to interact and collaborate with peers or adults in the learning process develops students' overall knowledge. According to [9] that in the five-stage levels of inquiry there is sharing between small and large groups but this step is done if there is extra time or the remaining time in learning, because of that then the social side of constructivism is needed in learning and something which must be done so that the development of students' abilities can be equitable and achieve maximum results, because children will develop when working with more capable people or adults [24] and social constructivism emphasize that learning is a social learning process not only occur in a fixed individual also developed by external forces [25].

3.2. Conceptual Model Inquiry-Based Social Constructivism (IbSC)

The conceptual model of Inquiry social constructivism is formulated from the literature review of the 5-stage level of inquiry with the psychology element of social constructivism that will be applied to chemistry learning in school. The formulation of the steps of inquiry-based social constructivism (IbSC) model are:

1. Observation: students observe a phenomenon that raises a problem that will be analyzed and studied in the lesson.
2. Peer Reconstruction: Students divide small groups who then exchanged opinions among students and other groups on the phenomena that get from observation problems.
3. Peer Manipulation: students in each group make ideas and collect data both qualitative and quantitative.
4. Generalization: students in small groups express inter-group ideas on collected data.
5. Peer Verification: Students in the group tested and analyzed the truth of the facts they found by relating them to the basic theories they already knew from the previous stage.
6. Application: students in the group told his opinion in turns to then agreed to the truth with a teacher direction is correct in learning and can be applied in everyday life.

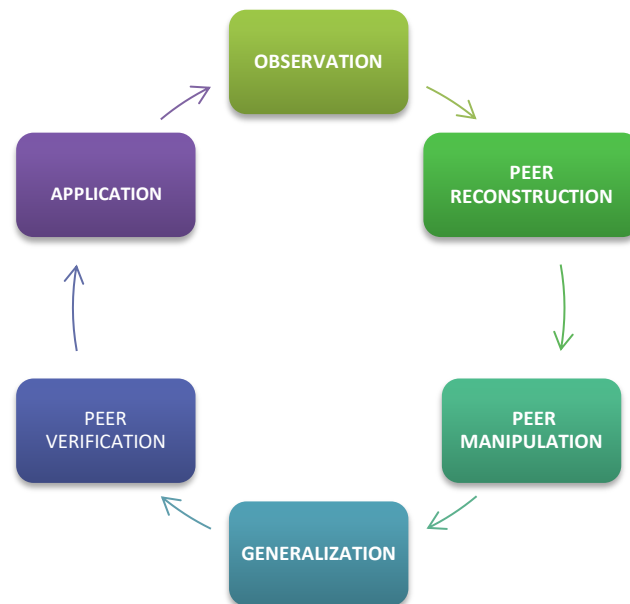


Figure 1. The steps of inquiry-based social constructivism (IbSC) model

The conceptual model of inquiry social constructivism is based on the five elements to be met according to [26]:

1. Syntax: Operational learning steps
2. Social system: the prevailing atmosphere and norms in teaching and learning activities
3. Principle of reaction: gives the teacher an idea of how to respond and direct student questions
4. Support system: facilities and environments that support learning
5. Instructional and nurture effects: results that students will achieve after learning

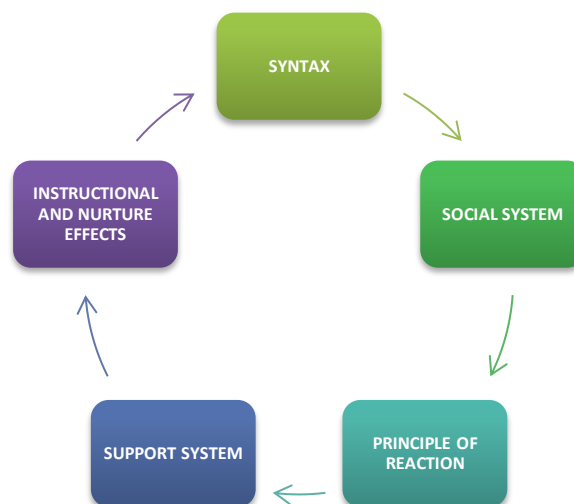


Figure 2. The steps of inquiry-based social constructivism (IbSC) model.

A conceptual model of learning inquiry based social constructivism (IbSC) is derived from the thought of literature review, along with thoughts drawn from the study.

Table 1. Review Levels of Inquiry, Student Skills, Student cognitive, Teaching Activity and Social Constructivism.

| Model of Inquiry | Discovery Learning | Interactive Demonstration | Inquiry Lesson | Inquiry Laboratory | Real-Word Application | Hypothetical Inquiry |
|--------------------------------|--------------------|---------------------------|--|--------------------|-----------------------|----------------------|
| Level of Student Skills | Rudimentary Skills | Basic Skills | Intermediate Skills | Integrated Skills | Culminating Skills | Advanced Skills |
| S I N T A K | | | Observation Manipulation Generalization Verification Application | | | |
| Level of Kognitif | Low | | Intellectual Shopistication | | | High |
| Teaching Activity | Teacher | | Locus of Control | | | Student |
| Level of Social Constructivism | Deep | | Intermediate | | | Shadow |

From **Table 1**, it can be seen that its social constructivism element is weak at all levels of inquiry, in students have low levels of cognitive weakness, so that needs to add elements of social constructivism from the study of several kinds literature, because the social element is very important to be done in learning to state the ability of students from low level until high level in cognitive or skills. [27] the ability of a child is influenced by the ability to solve problems and exchange information with others to know more about it will be more clear, [28] in this case the teacher can be used as a source to guide and give students the opportunity to know how much understanding of students in study.

Table 2: Conceptual models Inquiry-based Social Constructivism (IbSC).

| Inquiry (Wenning) | Conceptual IbSC | Social Costructivism |
|-------------------|------------------------------------|-----------------------------|
| Observation → | Observation | - |
| - | Peer Reconstruction ← | Unsure Social Costructivism |
| Manipulation → | Peer Manipulation ← | Unsure Social Costructivism |
| Generalization → | Generalization | - |
| Verification → | Peer Interaction to Verification ← | Unsure Social Costructivism |

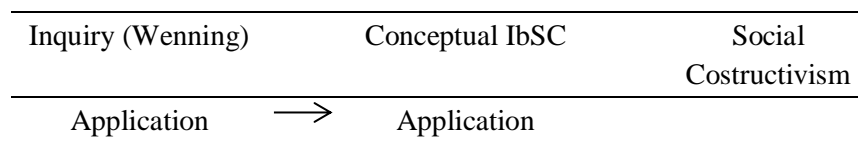


Table 2 shows the flow of thought that at least learning inquiry using social constructivism element occurs in several learning stages until the conceptual model of inquiry-based social constructivism (IbSC).

Conceptual Model of inquiry-based on social constructivism (IbSC) is built on three learning theories, namely; information processing theory (cognitive theory), constructivism theory, social constructivism theory and behavioral change theory as learning outcomes. The three theories underlie the development of learning models in this study. In epistemology, the learning model developed is essentially a strategy that is carried out to obtain knowledge, in this study through applied science learning. Ontologically, the model developed in this study has been studied based on a review of the philosophy of science. The truth in reconstructing original knowledge by applying the principles of philosophy, contributes to building the structure of scientific thinking that existed before.

In axiology, the model of inquiry based on social constructivism (IbSC) besides as knowledge also contains values, especially ethics, so the model has an attitude aspect obtained from the teaching and learning process. The model of inquiry based on social constructivism (IbSC) was developed from an inquiry which analyzed its deficiencies so as to underlie the birth of new syntax and modification to the existing syntax, ontologically considering the pattern of linkages in the flow of learning so that there is a match between expectations and reality in achieving learning objectives. The model developed is tailored to the needs in teaching learning. Learning problems are analyzed through preliminary studies in this study and require improvement of the learning process. The conceptual model in this study, developed for packaging and presentation of material, is oriented towards the achievement of the competency of the learning eye so that students can explore and explore their skills. In the conceptual model of inquiry-based social constructivism (IbSC) has considered the packaging of comprehensive learning materials and devices according to the principles in the Subject Specific Pedagogy (SSP).

Conceptual Model of inquiry-based social constructivism (IbSC) in the process of learning activities of students directed to achieve learning outcomes according to learning objectives include:

1. Learners are more actively involved in intellectual and emotional learning activities.
2. Students will be able to maximize the logic of their thinking.
3. Students who have high-level thinking skills such as critical and creative thinking (CCT) skills.
4. Improved cognitive abilities that are significant and better at expressing their opinions to communicate with others.
5. Development of cognitive processes, self-confidence, and improving evaluation skills in examining something and solving a problem.
6. Students will be actively disciplined, skilled in conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered from, or produced by observation, experience, reflection, reasoning, or communication, as a guide to beliefs and actions.
7. Students will be motivated, inspired, and motivated to have high expectations for the material they learn.
8. Increase their sharpness and imagination to think creatively and solutively.
9. A person is able to choose ideas or ideas that are more creative, more original, and more useful for themselves or the surrounding environment.

4. Conclusion

Based on the results of the study, it can be concluded that 1) Analysis of five stage levels of inquiry learning leads to winning after a literature study has found a weakness in the inquiry model that can be minimized using social constructivism. This is consistent with the opinion [9] that the inquiry learning model has been successfully carried out at Illinois state university. According to [24] human understanding and knowledge depend on understanding social experience and the strength of cognitive processes derived from the social interactions between individuals so that they can equalize success in learning. 2) The linkage of inquiry learning with social constructivism has a very close relationship which is very important to be done in learning to empower the skills of students from the low level to the high level in their cognitive and skills to achieve maximum learning outcomes. 3) Conceptual social constructivism inquiry learning model (ISC) can maximize student learning outcomes in overall chemistry learning with collaborative social systems between individuals in each step of learning, students have problem-solving skills, construct knowledge, build understanding of concepts. Researchers recommend educators to try to apply conceptual inquiry-based social constructivism models (IbSC) in learning especially chemistry to maximize student learning outcomes.

Acknowledgement

First and foremost, we full thankful to Allah SWT and Whole heartedly, we thank our college Universitas Sebelas Maret through LPPM provided funding for PNBPN research under contract No. 543/UN27.21/PP/2018.

References

- [1] Maya B, Jonathan M, Merrilea M & Bernie T 2015 Evolving assessment for a 21st century education ARC : A division of the CCR p 7
- [2] Sladana Z 2016 A Model of Critical Thinking as an Important Attribute for Success in the 21st Century Social and Behavioral Sciences **232** p 102 – 108
- [3] Wahab J 2013 Belajar dan pembelajaran sains. *Pustaka reka cipta*, Bandung p 42.
- [4] S.E. Department, U. N Yogyakarta, U.N.Yogyakarta, M. E. Education, and U. S. Tamansiswa 2018 The Development of Blog with Nos Within Inquiry Laboratory an Approach for Developing Scientific Literacy of the Student in Junior High School,” *Internasional Journal of Engineering & Technology* **7** (3.2) p 756–759
- [5] Kementrian Pendidikan dan Kebudayaan 2013 *Model Pembelajaran Penemuan* (Jakarta: Kemendikbud) p 3-10
- [6] Ibrahim B 2009 The Effects Of Guided Inquiry Instruction Incorporating A Cooperative Learning Approach On University Students’ Achievement Of Acid And Bases Concepts And Attitude Toward Guided Inquiry Instruction. *Scientific Research and Essay* **4** (10) p 1038-1046
- [7] Yudi M 2010 *Media Pembelajaran* (Jakarta: GP Press)
- [8] Cristina VS, Yovita NG 2006 Using a Guided Inquiry and Modeling Instructional Framework (EIMA) to Support Preservice K-8 Science Teaching Wiley InterScience (www.interscience.wiley.com) p159-185
- [9] Carl JW 2012 The Level Of Inquiry Model Of Science Teaching. *Journal Of Physics Teacher And Education Online* **6**(2) p 9-14
- [10] Carl JW 2005a Levels of inquiry: Hierarchies of pedagogical practices and inquiry processes. *Journal of Physics Teacher Education Online* **2**(3) p 3-11
- [11] Carl JW 2005b Implementing inquiry-based instruction in the science classroom: A new model for solving the improvement-of-practice problem. *Journal of Physics Teacher Education Online* **2**(4) p 9-15
- [12] Carl JW 2005c Minimizing resistance to inquiry- oriented instruction: The importance of climate setting. *Journal of Physics Teacher Education Online* **3**(2) p 10-15

- [13] Carl JW 2010 Levels of inquiry: Using inquiry spectrum learning sequences to teach science. *Journal of Physics Teacher Education Online* **5(4)** p 11-19
- [14] Carl JW & Khan MA 2011 Sample learning sequences based on the levels of inquiry model of science teaching. *Journal of Physics Teacher Education Online* **6(2)** p 17-30
- [15] Perdana R 2015 Pengembangan modul berbasis inkuiri terbimbing untuk meningkatkan hasil belajar siswa. *Procedings Seminar Nasional Pendidikan Sains, Universitas Sebelas Maret, Surakarta* p 102-106
- [16] Aulia N (2015), Pengembangan model (D-TAI) discovery team asistand instruction untuk meningkatkan kemampuan analisis siswa. Unpublished Thesis. *Universitas Sebelas Maret, Surakarta* p 201-225
- [17] Schunk DH & Zimmerman BJ 2005 Self-regulation and learning. In W. M. Reynolds & G. E. Miller (editor). *Handbook of Psychology (Volum 7, capitol 4)*. John Wiley and Sons, Inc.
- [18] Alan P, John W 2010 *Psychology for the Classroom: Constructivism and Social Learning* (London: David fulton book) p 34-43
- [19] Leeds-Hurwitz W 2009 *Social construction of reality. Encyclopedia of communication theory* p 892-895
- [20] Roya J, Hanieh DA 2015 Review of constructivism and social constructivism. *Journal of Social Sciences, Literature and Languages* **1(1)** p 9-16
- [21] Kementrian Pendidikan Dan Kebudayaan 2015 Data Pamer Ujian Nasional .
- [22] Terhart E 2003Constructivism and teaching: A new paradigm in general didactics? *Journal of Curriculum Studies* **35 (1)** p 25-44
- [23] Dewi NR, Akhlis I, Aini FN & Taufiq M 2018 The effect of inquiry-based independent worksheet using ict towards science learning to embody the student 's creativity and characters. *Internasional Journal of Engineering & Technology* **7 (2.29)** p 574–580
- [24] Vygotsky LS 1978 *Mind in Society: The Development of Higher Psychological Processes* (London: Harvard University Press)
- [25] Lutfiansyah DY & Hufad A 2018 The Conceptual Model of Community Learning Center (PKBM) in Indonesia and Community Cultural Learning Center (Kominkan) in Japan *Internasional Journal of Engineering & Technology* **7 (3.30)** p 246–250
- [26] Joyce B, Weil M & Shower B 2009 *Models of teaching* (Massachusetts: allyn and bacon).
- [27] Letitivia T 2015 Training models of social constructivism. Teaching based on developing a scaffold. *Social and Behavioral Sciences* 180 p 978 – 983
- [28] Perdana R 2018 Inquiry Laboratory: An Appropriate Learning Model for Teaching Salt hydrolysis in Chemistry. *AIP Conf. Proceeedings* **20069** p 1–8