

Developing A Learning Package Covering A Topic On Cells And Tissues Based On Guided-Inquiry Model And Integration Of Local Knowledge

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Abstract: This study aims to develop a learning package covering a topic on cells and tissues on the basis of guided-inquiry learning model and integration of local knowledge. The package manifests in a syllabus, lesson plans, and a module. The developmental model proposed by Dick and Carey (2009) was employed and adapted in the study. The instructional testing was carried out through three stages, namely, expert appraisal, small group test and main field test. The results of the study showed that the research produced a learning package with high validity, practicality, and efficacy. It was evidenced by the results of expert validation and developmental testing that reached 88.42% indicating high validity. With regard to its efficacy and utility in Biology learning, the gain score reached 0.78 attesting its merits.

Key Words: learning package, cells, and tissues, guided-inquiry, local potential

Abstrak: Penelitian ini bertujuan untuk mengembangkan perangkat pembelajaran materi sel dan jaringan dengan model pembelajaran inkuiri terbimbing berbasis potensi lokal dengan hasil berupa silabus, RPP, dan modul. Model pengembangan perangkat pembelajaran dalam penelitian ini diadaptasi dari model pengembangan Dick and Carey (2009). Uji coba dilakukan tiga tahap yaitu (1) uji coba/validasi ahli; (2) uji coba (keterbacaan) kelompok kecil; dan (3) uji coba lapangan. Berdasarkan hasil penelitian dan pengembangan, perangkat pembelajaran materi sel dan jaringan yang dikembangkan telah memenuhi kualitas sangat valid, praktis, dan memiliki tingkat keefektifan tinggi. Hasil yang didapatkan dari uji validasi/ahli dan uji coba diperoleh nilai lebih dari 88,42% yang menunjukkan bahwa perangkat pembelajaran sangat valid untuk digunakan dan *gain score* dari tes hasil belajar diperoleh nilai sebesar 0,78 yang berarti bahwa perangkat pembelajaran telah efektif digunakan pada pembelajaran.

Kata kunci: perangkat pembelajaran, sel dan jaringan, inkuiri terbimbing, potensi lokal

Activity-based learning, considering its merits, is of great importance to be carried out in elementary and secondary education. It attempts to create a learning atmosphere which is interactive, inspiring and enjoyable. It encourages active learning in which the students are motivated to experience collaborative and contextual activities, all of which consider their interests, psychological needs, and cognitive development. As biology learning takes place, it verily facilitates the students to interact with nature and its phenomenon. Dealing with nature, we are inevitably faced with daily problems, the answers of which can actually be found in biology. Moreover, as an

essential field of inquiry which concerns with the study of life, living organisms, and their intricate system, Biology learning places emphasis on experiential learning in which the students can fully develop their sense of inquiry, curiosity, and discovery (Amin, 2006).

With regard to learning of biology, a topic about cells and tissues is difficult for the students. This is so, for this topic deals with microbiological objects, an abstract process within cells and tissues invisible to the naked eye. Concerning such a challenging topic, biology learning in the school, however, still perpetuates teaching and learning activities that consequently impose setbacks on the students learning. The prevalent

setbacks are spelled out as follows; (1) the teacher still favors verbal explanation and, though conducting laboratory activities, the teaching techniques less vary, (2) the laboratory activities are still carried out in a teacher-centered manner, (3) the students hardly understand the relation between cells and tissues, and (4) it is rare to find the students posing factual and logical questions. The need analysis carried out, pertaining to the teacher and the student, shows that instead of experiencing discovery learning, the students are merely asked to memorize concepts or facts. To effectively and meaningfully learn, the students need practical experience and to be exposed to contextualized learning materials that closely correspond to the natural phenomenon they encounter daily. Therefore, inquiry-based learning is a model that best suits the students' needs to discover and construct more meaningful learning experience.

Llewellyn (2013) states that inquiry model is classified based on to what extent the roles that the teacher and the student share. With regard to this, there are four types of this model, namely, demonstrated inquiry, structured inquiry, guided inquiry and open-ended inquiry, respectively. Considering the absence of discovery and problem-solving activities, in the present study, guided inquiry is considerably chosen as other models require the students' familiarity with the aforementioned type of activities. According to Llewellyn (2013), the guided inquiry comprises these several phases; exploring the phenomenon, focusing on questions posed, planning an investigation, carrying out the investigation, analyzing the data, constructing new knowledge, and communicating the knowledge. Moreover, the findings of current studies have shown that inquire-based teaching model is positively influential in enhancing the students' scientific knowledge and skill (Simsek and Kabanipar, 2010, Ergul, *et al.*, 2011). Moreover, inquiry-based learning can foster the sense of independence in the students' reasoning, shape their curiosity and creativity, and promote the sense of long-life learning (Llewellyn, 2013; Neka *et al.*, 2015). In so doing, the teacher has an essential role to help the student obtain meaningful learning experience.

Integrating familiar social contexts, which the students are close to, into class activities can make the learning more meaningful. By so doing, biology learning provides the students with actual and natural phenomenon supporting the sense of meaningfulness in the class (Widowati, 2012; Poedjiaji, 2005). Indeed, with regard to the 2013 curriculum, the teachers are central to achieve the objectives so that they have to be well-

prepared. In addition to this, developing a rigorous and good teaching and learning package, therefore, is of great importance. Most importantly, it has to accommodate the students' needs, adjust to the school environment and correspond to the students' social contexts (Berns & Erickson, 2001). Therefore, to occupy this niche, the present study is projected to develop the teaching and learning package realized as a syllabus, a lesson plan, and a module based on guided inquiry model and adopted Surabaya local contexts, particularly on a topic covering cells and tissues.

METHOD

This study is referred as research and development model since it aims to develop a teaching and learning package manifesting in a syllabus, a lesson plan, and a module. The R&D model proposed by Dick and Carey (2009) was employed and spelled out into 9 phases; (1) identifying the needs and objectives of learning, (2) carrying out instructional analysis, (3) analyzing the students' initial behaviors and characteristics, (4) determining performance objectives, (5) developing criterion-referenced test items, (6) developing instructional strategies, (7) compiling and developing instructional materials, (8) developing and conducting formative evaluation, and (9) revising the learning materials. This study was conducted within January–November, 2016. To test the readability, a trial study was carried out in SMA Al Hikmah, Surabaya, involving small group evaluation consisting of 9 students and main field testing consisting of 24 students.

RESULTS

The findings of this R&D model yielded syllabus, lesson plan, and module, all of which pertain to the chosen topic, cells and tissues. Indeed, the products were governed by a guided-inquiry model of learning. They had been validated by experts in the field and had undergone small group evaluation or operational field testing and main field testing. The development of the products corresponded to the 9 R&D phases proposed by Dick and Carey (2009). The expert appraisal and developmental testing on the teaching and learning products yielded the data presented in the paper.

The validation constituted a range of data obtained from the experts chosen on the basis of their knowledge of the area investigated; course book de-

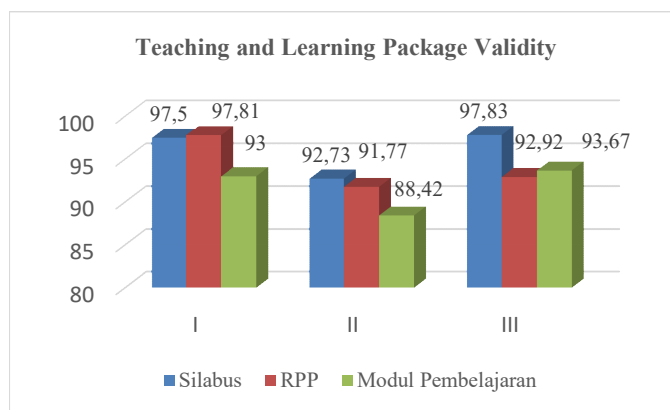


Figure 1. Teaching and Learning Package Validity

Notes: I = Expert on The Package Development; II = Expert on Content Development; III = Teacher

Table 1. Small Group Evaluation (Module Readability)

No	Learning Package	Achievement (%)	Qualification	Conclusion
1	Module	94,03	Highly valid	It is very good to be used

velopment, instructional materials, and teaching. Moreover, the developmental testing constituted small group evaluation and main field testing. The form of the questionnaire was developed on the basis of the items or aspects evaluated. Each of them corresponded to different objectives of each product and types of data needed. This is so, for it is to ensure that valid data pertaining to the perception and the quality of the product could be elicited.

The results of the expert validation were qualitatively analyzed. On the other hand, the results of the developing testing were quantitatively analyzed. Three raters, chosen on the basis of their knowledge on the field, stated that the teaching and learning package comprising the syllabus, lesson plan, and module yielded high validity. Germane to this, it is shown in the Figure 1.

To test the readability, small group evaluation involving 9 high school students was conducted. These 12 graders had previously learned about cells and tissues in their biology class. A questionnaire was developed to gather data related to the students' opinion on the module, the components of which include language, presentation, appearance and utility. It is presented in Table 1.

Moreover, the main field testing was conducted to test the efficacy the learning package as it was employed in the classroom situation in which its relations to the students' response and learning outcomes were evaluated.

To gather the data needed, two observers were asked to investigate the learning process taking place in the classroom. Each meeting had met three basic phases of teaching and learning: opening, whilst and closing activities. Each phase had corresponded to guided-inquiry model, particularly in the whilst activity. Based on the observation, the efficacy of the learning package covering a topic on cells and tissues in the class setting showed significant result by 100%. It indicated that the teacher had successfully performed all components specified in the syllabus, lesson plan, and module.

With regard to the learning outcomes, the data showed significant increases in the learning outcomes, as evidenced by the average score of the pre-test (38.13) and the post-test (86.67). The efficacy test of the module was determined by applying a formula pertaining to the students' gain score, pre-test score, and post-test score. The gain score made 0.78 which meant that the module on cells and tissues yielded high efficacy in relation to the learner outcomes.

With regard to the students' response to the module, the results of the interviews and questionnaires revealed that most of the students showed interest in the guided-inquiry based module covering a topic on cells and tissues.

Learning the structure and function of cells and tissues with the guided-inquiry based module was considered very interesting and not boring by the students (83.33%). Students also stated that the module helps

them to actively participate in the learning (83.33%), and improve their curiosity and achievement (91.67%), and their creativity (79.17 %).

Based on the responses of students, guided inquiry learning model based on local potential increased their motivation to learn Biology (91.67%), lifted their spirit of learning (83.33%), helped them think more critically (79.17%), and helped them apply scientific methods (91.67% of students agreed and 8.33% of students strongly agreed). They also stated that it helped them remember the concepts better.

Moreover, the students agreed the guided-inquiry model ran well during the learning process (91.67%). It was also found that the module improved the students' sense of independent learning. The students also stated that the guided-inquiry module made the learning materials easier to understand (12.5% of them strongly agreed and 79.17% of them agreed). However, some students did not agree with that (4.17%).

The guided-inquiry model integrated with local contexts could make Biology learning, particularly about the structures and functions of cells and tissues, more interesting. It made the students feel appreciated when they stated their opinions so that they did not feel uneasy to express their opinions.

DISCUSSION

The present study produced a teaching and learning package manifesting in a syllabus, a lesson plan, and a module. The expert validation and developmental testing provided insights for the revision. Indeed, the products of this study were developed on the basis of a guided-inquiry model of learning and integration of local contexts.

This model provides a guide for the students to understand concepts, meaning, and relationships in their learning so that they eventually arrive at meaningful inferences. This notion corresponds to Llewellyn (2002) stating that guided-inquiry model engages the students in discovery learning. It applies a scientific method that fosters the students' critical thinking, gives an ample chance for them to inquire about the phenomenon and enables them to plan an investigation to answer the questions.

Learning activities specified in the syllabus and lesson plan were developed on the basis on inquiry syntax proposed by Llewellyn (2013). According to Llewellyn (2013), inquiry syntax constitutes several stages, namely, exploring the phenomenon, focusing

on questions posed, planning an investigation, carrying out the investigation, analyzing the data, constructing new knowledge, and communicating the knowledge.

The integration of Surabaya local contexts into the learning materials specified in the module closely corresponds to the phases in the guided-inquiry model. The module comprises two main topics, cells, and tissues, the presentation of which is orderly graded and connected on the basis of their process. This is so, for it will enable the students to grasp a holistic picture pertaining to the concepts that cells and tissues are inextricably linked as principle constituents of all living organisms.

The learning module also corresponds to characteristics stipulated by Department of National Education (2003) spelled out as follows. a) Self-instructional; the module provides independent learning materials. b) Self-contained; the module covers learning materials which are holistically interconnected. c) Stand-alone; the module can be used as the main resource, not the companion one. d) User-friendly; the module is composed in fairly understood language which is digestible for the students.

To mention the merits of the module are as follows 1) learning materials are orderly graded on the basis on inquiry phases so that it fosters independent learning, 2) it employs guided-inquiry model that places equal emphasis on cognitive, affective and psychomotor domain, 3) it provides articles obtained from reputable journals to present valid and current findings on the field, 4) the module provides Bio Box in which the students are exposed to information accommodating familiar local knowledge in Surabaya. The module also provides a knowledge-honing section (*kolom Asah Pengetahuan*). This is aimed to help the students sharpen their understanding effectively as the information is presented in concise points. Such sections are deemed to be necessary to enhance their understanding on concepts sprawl over learning or laboratory activities.

The learning materials in the module are inductively presented. Prior to coming over concepts, the students are faced with selected phenomenon intriguing their curiosity to critically pose questions. This sense of inquiry and curiosity are driven into learning activities that encourage them to conduct an analysis. The phase of analysis is central to their learning. Analysis relates to an ability to select necessary and relevant information, investigate the relationships among the components and distinguish facts from phantasies (Anderson & Krathwohl, 2001).

In addition to the aforementioned merits, the module also employs images to give more clarity on the information. This is so, for the images can illustrate the objects more vividly and concretely, as expected to strengthen the understanding. Indeed, numerous studies have attested the findings on the use of charts, images and multimedia towards long-time memory pertaining to concepts and ideas (Reid, 1990; Joyce *et al.*, 2000; Nayar and Pushpam, 2000; Çimer, 2007; 2012).

Moreover, to ensure that the module is highly informative and readable, it is written with words that the students can easily understand. Moreover, as it deals with the topic on cells and tissues, the supporting images are also presented interactively. This is so, for this module also corresponds to the demands of the 2013 curriculum in which obscurity of concepts should be avoided.

However, this module has some limitations to consider as follows 1) it covers only two topics, cells, and tissues, 2) it only explores the local knowledge in Surabaya, 3) to maximize the learning, it requires the teacher to activate the background knowledge of the students by the use of video and other available media, 4) it requires good time management skills so that the activities run well.

The development of this module attempts to create a learning atmosphere which is interactive, inspiring and enjoyable. The students are expected to have a meaningful learning experience in which they are engaged in scientific activities, namely, collecting data, raising questions, investigating and analyzing the data and drawing and communicating conclusions. Such phases will foster their critical thinking.

Critical thinking ability is essential in the biology learning. According to Johnson (2011), critical thinking includes a systematic process of thinking that allows the students to develop and self-regulate their own thinking. Aspects of critical thinking accentuated in this study are to formulate research problems, give arguments, demonstrate deductive reasoning in analysis and investigation step, display inductive reasoning, as evidenced in the process of gathering data and making generalizations from them, and present the findings through tables or graphs.

According to Dahar (1996), the students' ability to apply scientific method deals with a systematic process of learning. This systematic process, in the study, constitutes conducting observation, planning an experiment and communicating the findings of the experiment. The implementation of guided-inquiry model creates an active learning.

All activities developed and structured in the syllabus, lesson plan and module provide the students with the factual, conceptual and procedural knowledge, all of which are to foster the students' critical thinking. As a result, the students are expected to be able to solve problems related to what they encounter in their surroundings. It particularly enables the students to solve problems related to local natural phenomenon so that they can preserve and maximize the potential of the natural richness in which they live.

CONCLUSION

The findings of this study manifest in a teaching and learning package comprising the syllabus, lesson plan, and module covering two main topics about cells and tissues, all of which are structured on the basis of guided-inquiry model and integration of local knowledge. With regard to the expert evaluation and developmental testing, the products yield a high degree of validity, practicality, and efficacy, as evidenced by the result reaching the above aspects by 88.42% and the gain score reaching 0.78 indicating the efficacy of the teaching and learning package.

Germane to the findings of this R&D model, in order to achieve a wider audience and gain more practical advantages, it is, therefore, necessary to disseminate the teaching and learning package. The learner characteristics, advancement of technology and social contexts where the students live should be considered as ones attempt to further develop another teaching and learning package.

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