

INOVASI PEMBELAJARAN

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Pengemb pendidikan ipa

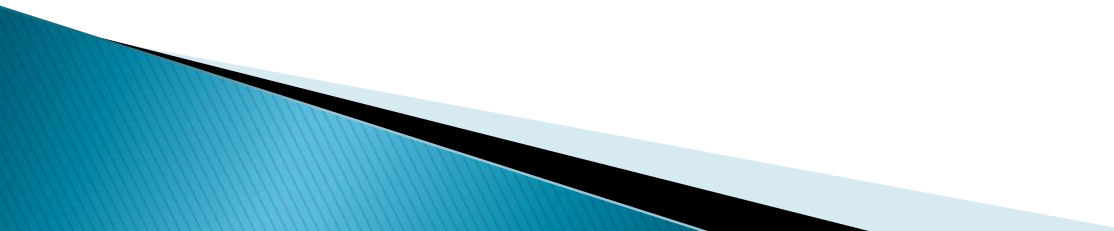
Definisi Discovery Learning

- ▶ According to van Joolingen (1999:385): “Discovery learning is a type of learning where learners construct their own knowledge by experimenting with a domain, and inferring rules from the results of these experiments. The basic idea of this kind of learning is that because learners can design their own experiments in the domain and infer the rules of the domain themselves they are actually constructing their knowledge. Because of these constructive activities, it is assumed they will understand the domain at a higher level than when the necessary information is just presented by a teacher or an expository learning environment.”

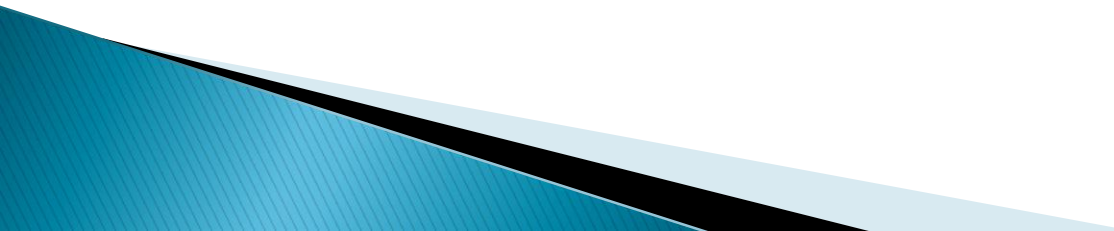
- ▶ According to Judith Conway's Educational Technology's Effect on Models of Instruction: “Jerome Bruner was influential in defining Discovery Learning. It uses Cognitive psychology as a base. Discovery learning is "an approach to instruction through which students interact with their environment—by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments" (Ormrod, 1995, p. 442) The idea is that students are more likely to remember concepts they discover on their own. Teachers have found that discovery learning is most successful when students have prerequisite knowledge and undergo some structured experiences.” (Roblyer, Edwards, and Havriluk, 1997, p 68).

- ▶ In research on scientific discovery learning, it has been found that in order for discovery of learning to be successful, learners need to possess a number of discovery skills (De Jong & Van Joolingen, in press), including hypothesis generation, experiment design, prediction, and data analysis. In addition, regulative skills like planning and monitoring are needed for successful discovery learning (Njoo & De Jong, 1993). Apart from being supportive for learning about the domain at hand, these skills are usually also seen as a learning goal in itself, as they are needed in a complex information society. Lack of these skills can result in ineffective discovery behavior, like designing inconclusive experiments, confirmation bias and drawing incorrect conclusions from data. In its turn, ineffective discovery behavior does not contribute to creating new knowledge in the mind of the learner.

Models of discovery learning

- ▶ Collaborative discovery learning
 - ▶ Discovery learning with microworlds
 - ▶ Experiential learning (to some extent)
 - ▶ Guided discovery learning
 - ▶ Incidental learning
 - ▶ Learning by exploring (exploratory learning)
 - ▶ Simulation-based learning
 - ▶ Case-based learning
 - ▶ Problem-based learning
 - ▶ inquiry-based learning
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Problem Solving

- ▶ Menggunakan teori dan pengetahuan yang diperoleh untuk memecahkan masalah.
 - ▶ Masalah yang diangkat tidak dapat diselesaikan hanya dengan mengingat teori yang diketahui.
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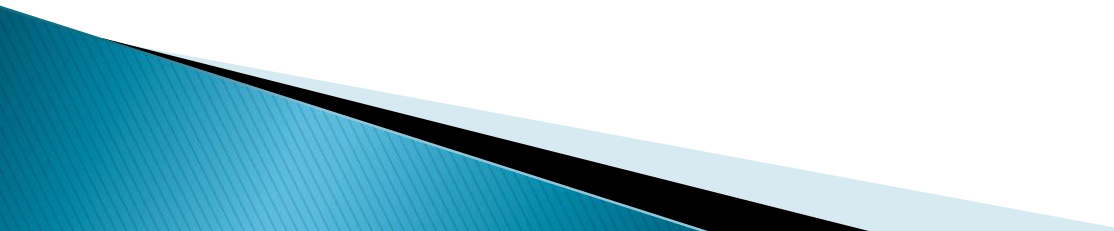
Problem Based Learning

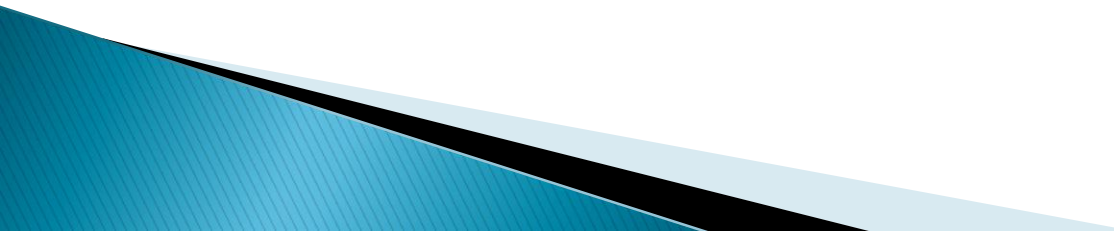
- ▶ Masalah digunakan sebagai dasar untuk memperoleh pengetahuan baru

Dalam PBL, siswa mempelajari:

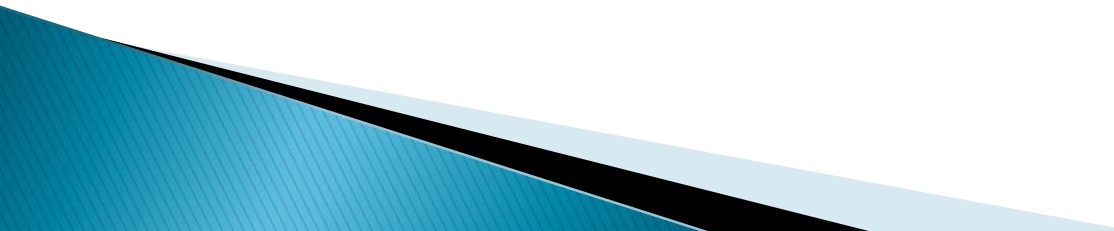
- ▶ Problem-solving skills
- ▶ Self-directed learning skills
- ▶ Ability to find and use appropriate resources
- ▶ Critical thinking
- ▶ Measurable knowledge base
- ▶ Performance ability
- ▶ Social and ethical skills
- ▶ Self-sufficient and self-motivated
- ▶ Facility with computer
- ▶ Leadership skills
- ▶ Ability to work on a team
- ▶ Communication skills
- ▶ Proactive thinking
- ▶ Congruence with workplace skills


Keterangan


- ▶ Self sufficient:
 - ▶ Mencari sendiri berbagai informasi yang menurut mereka perlu untuk dilibatkan dalam menyelesaikan masalah melalui kegiatan bertanya kepada diri mereka sendiri.
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- ▶ There are many problem-based learning models. E.g. Edwin Bridges (1992) suggests that there are two versions of PBL that have been implemented in the classroom,
 - ▶ problem-stimulated PBL and
 - ▶ Student Centered PBL.
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PS PBL

- ▶ PS PBL uses role relevant problems in order to introduce and learn new knowledge. The Prospective Principals Program at Stanford University's School of Education employs PS PBL in its curriculum.
 - ▶ PS PBL emphasizes 3 major goals:
 - ▶ development of domain-specific skills
 - ▶ development of problem-solving skills
 - ▶ acquisition of domain-specific knowledge
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- ▶ The PS PBL Process Students receive the following learning materials:
 - the problem ;
 - a list of objectives that the student is expected to master while working on the problem ;
 - a reference list of materials that pertain to the basic objectives ;
 - questions that focus on important concepts and applications of the knowledge base.
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- ▶ Students work in teams to complete the project, resolve the problem, and accomplish the learning objectives.
 - each student has a particular role in the team – leader, facilitator, recorder, or team member
 - time allotted to each project is fixed
 - the team schedules its own activities and decides how to use the allotted time
 - ▶ Student performance is evaluated by instructors, peers, and self using questionnaires, interviews, observation, and other assessment methods.
 - ▶ Throughout the process, instructors serve as resources to the teams and provide guidance and direction if the team asks for it or becomes stymied in the project
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Student Centered PBL (SC PBL)

- ▶ The process appears to be similar to that of PS PBL, but there are significant differences in each step, which are driven by the goal of fostering life-long learning skills. The major differences are in student responsibilities. In SC PBL:
 - ▶ students identify the learning issues they wish to explore;
 - ▶ students determine the content to be mastered;
 - ▶ students determine and locate the resources to be used.

Guided Discovery

- ▶ Guided discovery berada diantara pendekatan student centered dan teacher centered.
- ▶ Is not restricted to finding something entirely new to the world such as an invention (television) or theory (heliocentric view of the universe). It is a matter of your students internally rearranging data so they can go beyond the more facts to form concepts new to them.
- ▶ Involves students finding their own meanings, organization, and structure of ideas. (Carin, A.A, hal 92, 1994).

Inquiry

- ▶ Proses yang ditempuh manusia untuk mendapatkan informasi atau untuk memecahkan suatu permasalahan.
- ▶ Mempersiapkan situasi anak untuk melakukan eksperimensendiri, dalam arti luas melihat apa yang terjadi, ingin melakukan sesuatu, ingin menggunakan simbol-simbol dan mencari jawaban atas pertanyaan sendiri, menghub, penemuan yang satu dengan yang lain, membandingkan yang ditemukan sendiri dengan yang ditemukan orang lain. (Piaget)

Observing (melakukan pengamatan)

- ▶ Siswa melakukan observing jika dapat:
- ▶ Mengidentifikasi property benda-benda seperti misalnya warna, ukuran, bentuk, dengan menggunakan berbagai inderanya. (contoh pertanyaan umum: apa saja yang kamu perhatikan dengan benda-benda ini? Contoh pertanyaan khusus: apa warna benda ini? Dsb.)
- ▶ Menyatakan perubahan yang terjadi pada benda atau kejadian. (contoh pertanyaan umum: perubahan apa yang kamu perhatikan?)
- ▶ Menyatakan persamaan dan perbedaan yang teramati pada benda-benda atau kejadian. (apa persamaannya? Apa perbedaannya?)

Classifying (mengklasifikasi/ mengelompokkan).

- ▶ Siswa dapat mengklasifikasi jika:
- ▶ Mengelompokkan benda–benda atau kejadian/kejadian berdasarkan propertinya atau kegunaan–kegunaannya. (dengan cara apa kamu mengelompokkan benda–benda ini?)
- ▶ Menyusun benda–benda atau kejadian–kejadian secara urut berdasarkan beberapa proterti atau nilai. (Bagaimana seharusnya urutan benda–benda ini?)

Measuring (mengukur).

- ▶ Siswa dapat mengukur bila:
- ▶ Menggunakan alat-alat standar (seperti penggaris, jam, timbangan, dsb) untuk menemukan kuantitas. (Alat standar apa yang akan kamu gunakan untuk mengukur ini?)
- ▶ Menggunakan benda-benda yang biasanya digunakan orang awam untuk mengukur kuantitas. (benda-benda apa saja yang biasanya digunakan oleh orang-orang disekeliling tempat tinggalmu untuk mengukur ini?)
- ▶ Membuat gambar skala atau model. (Bagaimana gambar skala atau model dari benda ini?) Gambar skala yang dimaksudkan adalah jika mereka menggambar 2 binatang yaitu semut dan gajah tentunya mereka akan menggambarkan gajah lebih besar dibandingkan semut.
- ▶ Menggunakan contoh sederhana dan menaksirkan/ mengestimasi teknik-teknik. (bagaimana seharusnya kita memperoleh contoh yang sesuai atau menaksirkan hal ini?)

Communicating (mengkomunikasikan)

- ▶ Siswa mengkomunikasikan bila dapat:
- ▶ Mendefinisikan kata-kata secara operasional – melalui beberapa tindakan– ketika diperlukan. (apasaja yang perlu digambarkan/ disajikan dari eksperimen ini?)
- ▶ Menggambarkan benda-benda atau kejadian-kejadian. (bagaimana gambaran dari hasil ini sehingga orang lain tahu apa yang kamu maksudkan?)
- ▶ Membuat bagan dan grafik (bagaimana gambar atau grafiknya untuk menunjukkan penemuan/ hasil yang kamu peroleh?)
- ▶ Merekam data yang diperlukan. (bagaimana kita menjaga arah pengamatan kita?)
- ▶ Membangun hasil yang seharusnya disajikan dan model-model. (bagaimana kita dapat menunjukkan kepad orang lain cara kerjanya?)
- ▶ Menggambarkan berbagai diagram, gambar, dan peta. (gambar apa saja yang dapat kita sajikan sehingga orang lain tahu tempatnya?)

Infering

- ▶ Siswa melakukan infering jika:
- ▶ Membedakan antara hasil pengamatan dan inferensi. Hasil pengamatan misalnya “apa saja yang kamu amati?” inferensi misalnya “hal ini memberikan gambaran apa kepada kamu ?”
- ▶ Menginterpretasikan/ memaknai rekaman data/ data yang diperoleh. (dari hasil eksperimen ini, apa maknanya/ kesimpulannya?)
- ▶ Menggambarkan kesimpulan dari data (dari informasi-informasi ini, apa yang telah kamu temukan tentang... ?)

Predicting

- ▶ Melakukan hipotesis dari data. (apa perkiraanmu untuk membuat agar hal ini dapat terjadi?)
- ▶ Memprediksi kejadian-kejadian/ peristiwa dari data yang diperoleh (apa yang kira-kira akan terjadi? Apa yang kamu maksudkan dengan ...?)

Experimenting. (bereksperimen/ melakukan percobaan)

- ▶ Siswa dapat melakukan percobaan jika:
 - ▶ Menguji hipotesis atau pertanyaan operasional. (contoh pertanyaan khusus: akankah dengan menghembuskan air akan mempercepat penguapan?)
 - ▶ Merancang prosedur dengan mengontrol variabel. (bagaimana cara menemukannya
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