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PENGEMBANGAN PERANGKAT PEMBELAJARAN IPA BIOLOGI SMP BERBASIS INKUIRI TERBIMBING DIPADU KOOPERATIF STAD SERTA PENGARUHNYA TERHADAP KEMAMPUAN BERPIKIR TINGKAT TINGGI, METAKOGNISI, DAN KETERAMPILAN PROSES SAINS PADA SISWA BERKEMAMPUAN AKADEMIK ATAS DAN BAWAH. Biologi terdiri dari aspek produk dan proses. Pembelajaran Biologi di Indonesia sebagian besar terbatas pada aspek produk. Pembelajaran yang terbatas pada aspek produk menyebabkan pembelajaran berbasis isi. Keberhasilan pembelajaran berbasis isi diukur dari banyaknya konsep yang berhasil dihafalkan oleh siswa, akibatnya kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains siswa memprihatinkan. Permasalahan penting lainnya adalah mensejajarkan prestasi belajar siswa berkemampuan akademik bawah (AB) dengan siswa berkemampuan akademik atas (AA). Vygotsky menyatakan, siswa AA dan AB dapat sejajar prestasi belajarnya, jika memperoleh *scaffolding* dari guru dan teman sebayanya.

Strategi pembelajaran yang berpotensi menyelesaikan permasalahan tersebut adalah Inkuiri terbimbing dan *STAD*. Inkuiri terbimbing terbukti mampu melatih berpikir tinggi, metakognisi, dan keterampilan proses sains. Strategi *STAD* terbukti mampu melatih berpikir tinggi dan metakognisi, selain itu kegiatan diskusi pada strategi *STAD* mampu memfasilitasi proses *scaffolding* melalui tutorial sebaya. Integrasi sintaks inkuiri terbimbing dan *STAD* berpotensi mampu meningkatkan kemampuan berpikir tinggi, metakognisi, dan



keterampilan proses sains, serta mampu mensejajarkan prestasi belajar siswa AA dan AB.

Tujuan penelitian terdiri dari tujuan penelitian pengembangan dan eksperimen. Penelitian pengembangan bertujuan mengembangkan perangkat pembelajaran. Penelitian eksperimen bertujuan sebagai berikut. (1) Mengetahui pengaruh strategi pembelajaran terhadap kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains. (2) Mengetahui pengaruh kemampuan akademik terhadap berpikir tinggi, metakognisi, dan keterampilan proses sains. (3) Mengetahui pengaruh interaksi strategi pembelajaran dengan kemampuan akademik terhadap kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains.

Tahap pengembangan merujuk pada Borg & Gall yaitu, tahap analisis kebutuhan, tahap pengembangan, dan tahap uji coba produk. Rancangan eksperimen menggunakan kuasi eksperimen pretes-postes *non equivalent control group design*. Variabel bebas adalah strategi pembelajaran dan kemampuan akademik. Variabel terikat adalah kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains. Populasi penelitian adalah seluruh siswa kelas VII SMPN di Surakarta. Penarikan sampel menggunakan *stratified random sampling* untuk menetapkan 8 sampel sekolah. Setiap sampel sekolah diambil 1 sampel kelas secara acak. Sampel penelitian sebanyak 136 orang siswa terdiri dari masing-masing 68 orang siswa AA dan AB. Kemampuan berpikir tinggi dan keterampilan proses sains diukur menggunakan tes esai. Kemampuan metakognisi diukur menggunakan *MAI (metacognitive awarness inventory)* dan rubrik metakognisi. Instrumen terlebih dahulu diuji validitas, reliabilitas, tingkat kesukaran, dan daya beda. Data diambil saat pretes dan postes. Analisis data menggunakan analisis deskriptif dan anakova dilanjutkan uji *LSD*. Sebelum uji anakova, dilakukan uji asumsi normalitas dan homogenitas varians. Uji normalitas menggunakan uji Kolmogorov-Smirnov. Uji homogenitas menggunakan uji Levene's. Semua penghitungan menggunakan program SPSS versi 16,0 pada taraf signifikansi 0,05 ($P < 0,05$).

Hasil pengembangan menunjukkan perangkat pembelajaran andal dalam meningkatkan kemampuan berpikir tinggi, metakognisi, dan



keterampilan proses sains. Hasil eksperimen sebagai berikut. (1) Strategi belajar berpengaruh terhadap kemampuan berpikir tinggi, metakognisi yang diukur menggunakan rubrik, dan keterampilan proses sains. Strategi belajar tidak berpengaruh terhadap kemampuan metakognisi yang diukur menggunakan MAI. (2) Terdapat perbedaan kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains pada kemampuan AA dan AB. (3) Terdapat pengaruh interaksi strategi pembelajaran dengan kemampuan akademik terhadap kemampuan berpikir tinggi dan metakognisi yang diukur menggunakan rubrik. Tidak terdapat pengaruh interaksi strategi pembelajaran dengan kemampuan akademik terhadap kemampuan metakognisi yang diukur menggunakan MAI dan keterampilan proses sains.

Strategi inkuiri terbimbing, *STAD*, dan gabungan (inkuiri-*STAD*) mampu memberdayakan berpikir tinggi, metakognisi, dan keterampilan proses sains. Strategi gabungan (inkuiri-*STAD*) andal dalam memberdayakan kemampuan berpikir tinggi. Strategi gabungan (inkuiri-*STAD*) andal dalam memberdayakan kemampuan metakognisi dan keterampilan proses sains setara dengan strategi inkuiri terbimbing. Interaksi strategi pembelajaran dengan kemampuan akademik menunjukkan, strategi *STAD* dan gabungan (inkuiri-*STAD*) mampu mensejajarkan kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains pada siswa AA dan AB. Strategi inkuiri terbimbing dan konvensional kurang mampu mensejajarkan kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains pada siswa AA dan AB. Persentase pergeseran rata-rata skor berpikir tinggi, metakognisi, dan keterampilan proses sains dari pretes ke postes pada strategi inkuiri terbimbing, *STAD*, dan gabungan (inkuiri-*STAD*) menunjukkan, siswa AB memiliki nilai lebih tinggi dibandingkan siswa AA.

Guru disarankan menerapkan strategi gabungan (inkuiri-*STAD*) untuk melatih kemampuan berpikir tinggi, metakognisi, dan keterampilan proses sains. Pembentukan kelas dengan kemampuan akademik homogen perlu dipertimbangkan, karena menyebabkan tidak efektifnya proses *scaffolding*. Pembelajaran berbasis kompetisi menyebabkan kesenjangan prestasi belajar siswa AA dan AB, perlu dipertimbangkan penggunaan pembelajaran berbasis kooperatif, baik



diterapkan secara mandiri atau digabung dengan strategi lain dalam pembelajaran biologi. [**Kata kunci:** Inkuiri, *STAD*, berpikir, metakognisi, keterampilan proses sains]

THE DEVELOPMENT OF TEACHING DEVICE OF BIOLOGICAL SCIENCE ON JUNIOR HIGH SCHOOL GUIDED INQUIRY-BASED INTEGRATED WITH STAD COOPERATIVE AS WELL AS ITS INFLUENCE TOWARD HIGHER ORDER THINKING, METACOGNITION AND SCIENCE PROCESS SKILLS ON HIGHER AND LOWER ACADEMIC ACHIEVEMEN.

Biology is divided into the aspects of product and process. Biological teaching in Indonesia generally is limited on product aspect. Teaching that is limited on product aspect causes teaching based on content. The success of content-based teaching can be measured from the amount of the concept that could be memorized successfully by the students, it resulted on higher order thinking, metacognition, and science process skills is still unsatisfactory. The other important problem is to parallelize students' learning ability in low academic ability (AB) with the students' learning in high academic ability (AA). Vygotsky states that, the students' ability on AA and AB can be parallelized his/her learning achievement, if they received *scaffolding* from their teacher and their friends.

Learning strategy have potential to solve the problems is a guided inquiry and *STAD*. Guided inquiry was proved to be able to train the higher order thinking, metacognition, and sciences process skills. Discussion activities on the strategy of *STAD* proved to be able to train higher order thinking and metacognition, besides the discussion activity on the strategy of *STAD* facilitates the existence of *scaffolding* through the peer tutorial. The integration of guided inquiry syntactic and *STAD* syntactic have potential to be able to improve higher order thinking, metacognition, and science process skills, as well as to be able to parallelize the student's learning achievement with his/her AA and AB abilities.

The purpose of this research consists of the purposes of development and experiment. The purpose of development research is to develop teaching device. The purposes of experiment research are: (1) To know the effect of teaching strategy towards higher order thinking,



metacognition, and science process skills; (2) To know the effect of academic achievement towards higher order thinking, metacognition, and science process skills; (3) To know the effect of teaching strategy interaction with academic achievement towards higher order thinking, metacognition, and science process skills.

The development stage refers to Borg & Gall, that is, the need analysis stage, development stage, and product try out stage. The design planning uses quasi-experiment pretest-posttest nonequivalent control group design. Independent variable is the teaching strategy and academic achievement. Dependent variable is the higher order thinking, metacognition, science process skills. Populations of the research are all of the seventh year students of SMPN (Public Junior High School) in Surakarta. The drawing sample uses stratified random sampling to decide 8 sample schools, each of the school sample taken 1 class randomly as a sample. There are 136 students consist of 68 students who have AA and AB achievement. The higher order thinking and science process skills measured by using essay test. Metacognition was measured by using MAI (*metacognitive awareness inventory*) and metacognition rubric. The instrument, the first validity, reliability, difficultness level, and distinctiveness power are tested. Data was taken from pretest and posttest. Data analyzed by using descriptive analysis and ANACOVA continued by LSD test. Before ANCOVA test, normality and homogeneity variants were tested. Normality test uses Kolmogorov-Smirnov test. Homogeneity test uses Levene's test. All of the accounts uses SPSS program 16.0 version in significance level of 0.05 ($P < 0.05$).

The result of the development shows that teaching device is potential to improve the higher order thinking, metacognition, and science process skills. The outcomes of the experiment are as follows: (1) learning strategy influences the higher order thinking, metacognition measured by using rubric, and science process skills. Learning strategy does not influence metacognition measured by using MAI; (2) there are differences among higher order thinking, metacognition, and science process skills on the achievement of AA and AB; (3) there is an influence of teaching strategy interaction and academic achievement toward the higher order thinking and metacognition measured by using rubric. There is no influence of teaching strategy interaction with academic



achievement toward metacognition measured by using MAI and science process skills.

Guided inquiry strategy, STAD, and combination (inquiry-STAD) are able to empower higher order thinking, metacognition, and science process skills. The combined strategy (inquiry-STAD) is able to empower the higher order thinking. The combined strategy (inquiry-STAD) is able to empower metacognition and science process skills parallel with the guided inquiry strategy. The interaction of teaching strategy with academic achievement show that the STAD strategy and the combination of (inquiry-STAD) is able to parallelize the higher order thinking, metacognition, and science process skills to the students who have AA and AB achievement. The guided inquiry strategy and conventional strategy is less able to parallelize the higher order thinking, metacognition, and science process skills to the students who have AA and AB achievement. The calculation of the percentage of average mobility of the higher order thinking, metacognition, and science process skills from pretest to posttest on the guided inquiry strategy, STAD, and the combination (inquiry-STAD) show that the students who have AA and AB achievement have the average scores of mobility percentage of pretest and posttest scores are higher than the student who have AA achievement.

The teacher is suggested to apply the combination strategy (inquiry-STAD) to practice higher order thinking, metacognition, and science process skills. The class establishment of with homogenous academic ability needs to be considered, because of the less effective of *scaffolding* process. Competitive-based teaching causes the gap between students' learning achievement AA and AB, need to be considered the use of cooperative-based teaching, either applied by itself or combined with the other strategy in biological teaching. **[Key words:** Inquiry, STAD, thinking skills, metacognition, science process skills]