



## BAB V

### SIMPULAN, IMPLIKASI DAN REKOMENDASI

#### 5.1. Simpulan

Berdasarkan hasil penelitian yang telah dilakukan dapat diambil kesimpulan sebagai berikut:

1. Karakteristik pembelajaran Biologi Sel menggunakan Pendekatan *drawing based modelling* untuk menstimulasi kemampuan representasi mikroskopis dan penalaran ilmiah mahasiswa dapat dikembangkan. Langkah-langkah Pendekatan *drawing based modelling* meliputi: a) *Expressive*, mahasiswa mampu mengungkapkan gagasan tentang topik dengan membuat model Struktur Sel dan Organel Sel, Membran Plasma, Transportasi zat, Metabolisme Sel, Pembelahan Sel, Kelainan Sel. Kemudian menggambarkan ide awal mereka, b) pada langkah kedua *Experimental*, mahasiswa mampu mengumpulkan data empiris untuk memvalidasi dan meningkatkan model gambar mereka melalui buku dan penjelasan dosen, c) pada langkah ketiga *Evaluative*, mahasiswa melakukan evaluasi gambar yang mereka buat dengan cara membandingkan model gambar mereka dengan rekan-rekan mereka dan untuk bertukar pemikiran, gagasan kritis dengan satu sama lain, d) pada langkah keempat *Exploratory*, dosen memberikan fenomena baru pada setiap pokok bahasan Biologi Sel dengan harapan memfasilitasi mahasiswa untuk memperbaiki gambar yang telah mereka buat. Setelah mengamati fenomena baru yang diberikan dosen, mahasiswa lalu bereksplorasi membuat gambar baru menggunakan aplikasi *eBeam Capture*. Praktikum dilaksanakan melalui observasi dan eksperimen pada materi Struktur Sel dan Organel Sel, Membran Plasma, Transportasi zat, Metabolisme Sel, Pembelahan Sel, Kelainan Sel dipandu dengan LKM (Lembar Kerja Mahasiswa) berbasis *drawing based modelling*. Materi pembelajaran Biologi Sel berupa Struktur Sel dan Organel Sel, Membran Plasma, Transportasi zat, Metabolisme Sel, Pembelahan Sel, Kelainan Sel merupakan materi yang membutuhkan representasi mikroskopis yang dibuat dalam bentuk gambar. Tujuan pembelajaran Biologi Sel melalui pendekatan *drawing based modelling*, yaitu untuk menstimulasi kemampuan

representasi mikroskopis dan penalaran ilmiah mahasiswa serta membekali mahasiswa agar dapat meningkatkan penguasaan konsep Biologi Sel.

2. Kemampuan representasi mikroskopis mahasiswa dikategorikan baik pada semua perlakuan, walaupun masih *fluktuatif* pada beberapa materi pokok bahasan Biologi Sel. Representasi mikroskopis sangat dipengaruhi oleh keterampilan ketepatan membuat gambar-2D berbantuan aplikasi komputer berupa *eBeam Capture*, deskripsi gambar, kerapihan gambar, kesesuaian gambar dan keterampilan kinerja mahasiswa. Kemampuan penalaran ilmiah mahasiswa pada pembelajaran Biologi Sel melalui pendekatan *drawing based modelling* dalam kategori baik. Walaupun pada beberapa indikator penalaran ilmiah, nilai rerata mahasiswa masih tampak rendah, terutama pada penalaran *justifikasi* pada setiap materi Biologi Sel. Sedangkan pada penalaran *synthesis* sangat baik nilai yang didapatkan oleh mahasiswa pada setiap materinya.
3. Hubungan antara kemampuan representasi dan penalaran ilmiah mahasiswa melalui pendekatan *drawing based modelling* pada pembelajaran Biologi Sel mempunyai hubungan positif dan berkorelasi signifikan.
4. Keunggulan pembelajaran Biologi Sel melalui pendekatan *drawing based modelling* berupa langkah-langkah pembelajaran yang sistematis dan *komprehensif*. Pendekatan *drawing based modelling* berbantuan aplikasi *eBeam Capture* memudahkan, mengefesiesikan dan mengefektifkan proses belajar dan pembelajaran Biologi Sel baik teori maupun praktikum. Selain keunggulan terdapat keterbatasan pembelajaran Biologi Sel melalui pendekatan *drawing based modelling* berupa alokasi waktu yang tersedia masih kurang dikarenakan pembuatan gambar yang detail banyak memakan waktu.
5. Tanggapan mahasiswa terhadap pembelajaran Biologi Sel melalui pendekatan *drawing based modelling* yang dikembangkan dalam menstimulasi kemampuan representasi mikroskopis dan penalaran ilmiah mahasiswa pada pembelajaran Biologi Sel mendapatkan tanggapan positif.

## 5.2. Implikasi

Berdasarkan hasil penelitian ini diperoleh implikasi bahwa kemampuan representasi mikroskopis dan penalaran ilmiah mahasiswa akan lebih komprehensif dan melengkapi pemahaman mahasiswa tentang Biologi Sel serta

memudahkan mahasiswa untuk mempelajari mata kuliah selanjutnya, yaitu anatomi tumbuhan, evolusi dan perkembangan hewan, mikrobiologi dan bioteknologi. Selain itu, hal penting dalam menggunakan pendekatan *drawing based modelling* ini dapat menstimulasi ketelitian, kemandirian, keingintahuan, kepercayaan diri mahasiswa ketika menjadi guru biologi.

### 5.3. Rekomendasi

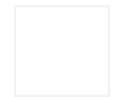
Hasil penelitian menunjukkan bahwa pendekatan *drawing based modelling* dapat menstimulasi kemampuan representasi mikroskopis dan penalaran ilmiah mahasiswa serta dapat membekali keterampilan kinerja mahasiswa berupa keterampilan mengoperasikan *ebeam capture* (KM-Ebeam), keterampilan pengenalan dan cara kerja mikroskop (KPCCKM), keterampilan membuat gambar (KMG), keterampilan penggunaan alokasi waktu (KPAW) dan keterampilan mengamati preparat jadi (KMPJ). Oleh karena itu, untuk perbaikan terus menerus (*continues improovment*) selanjutnya perlu dilakukan hal-hal sebagai berikut. 1) untuk keberlanjutan pendekatan pembelajaran ini bagi dosen LPTK, Program Studi Pendidikan Biologi, hendaknya menggunakan pendekatan *drawing based modelling* yang telah dikembangkan. Dosen mata kuliah diharapkan dapat memberikan pengalaman belajar kepada mahasiswa sesuai dengan tujuan mata kuliah yang mampu menstimulasi kemampuan representasi mikroskopis dan penalaran ilmiah untuk lebih komprehensif berpikirnya mahasiswa dalam menghadapi dunia nyata, yaitu guru biologi. 2) untuk inovasi dalam media pembelajaran pada era digital saat ini, dosen atau guru perlu membiasakan menggunakan teknologi canggih berupa aplikasi komputer berupa *eBeam Capture* yang digunakan sebagai pengembangan imajinasi mahasiswa atau siswa. Aplikasi komputer berupa *eBeam Capture* ini digunakan untuk menggambar yang bertujuan untuk mengurangi ketergantungan kepada kertas (*paper less*). 3) penelitian dibidang kependidikan ini, yaitu tentang menstimulasi kemampuan representasi mikroskopis dan penalaran ilmiah melalui pendekatan *drawing based modelling* pada Biologi Sel merupakan penelitian yang masih dikembangkan lebih luas tidak hanya di perguruan tinggi untuk para mahasiswa dengan mata kuliah Biologi Sel saja, tetapi juga perlu pengembangan sejak dini ketika di jenjang pendidikan dasar dan menengah.




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


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
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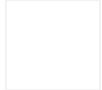


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