LAPORAN AKHIR PENELITIAN MULTI TAHUN

ID Proposal: 7ac4f7c5-82d5-461d-b6e7-821df2700339
Laporan Akhir Penelitian: tahun ke-2 dari 2 tahun

1. IDENTITAS PENELITIAN

A. JUDUL PENELITIAN

Model Media Pembelajaran Berbasis Teknologi Mobile Untuk Meningkatkan Kompetensi Siswa Sekolah Dasar Pasca Pembelajaran di Kelas

B. BIDANG, TEMA, TOPIK, DAN RUMPUN BIDANG ILMU

Bidang Fokus RIRN / Bidang Unggulan Perguruan Tinggi	Tema	Topik (jika ada)	Rumpun Bidang Ilmu
Teknologi Informasi dan Komunikasi	Teknologi piranti tik dan pendukung TIK	Kebijakan dan sosial humaniora pendukung TIK	Teknologi Informasi

C. KATEGORI, SKEMA, SBK, TARGET TKT DAN LAMA PENELITIAN

Kategori (Kompetitif Nasional/ Desentralisasi/ Penugasan)	Skema Penelitian	Strata (Dasar/ Terapan/ Pengembangan)	SBK (Dasar, Terapan, Pengembangan)	Target Akhir TKT	Lama Penelitian (Tahun)
Penelitian Kompetitif Nasional	Penelitian Dasar	SBK Riset Dasar	SBK Riset Dasar	3	2

2. IDENTITAS PENGUSUL

Nama, Peran	Perguruan Tinggi/ Institusi	Program Studi/ Bagian	Bidang Tugas	ID Sinta	H-Index
BAHAR Ketua Pengusul	STMIK Banjarbaru	Teknik Informatika		6029259	1
SOEGIARTO M.Kom Anggota Pengusul 1	STMIK Banjarbaru	Teknik Informatika	Koordinator Pengembang Media IT	6003721	0

3. MITRA KERJASAMA PENELITIAN (JIKA ADA)

Pelaksanaan penelitian dapat melibatkan mitra kerjasama, yaitu mitra kerjasama dalam melaksanakan penelitian, mitra sebagai calon pengguna hasil penelitian, atau mitra investor

Mitra	Nama Mitra

4. LUARAN DAN TARGET CAPAIAN

Luaran Wajib

Tahun Luaran	Jenis Luaran	Status target capaian (*accepted, published, terdaftar atau granted, atau status lainnya*)	Keterangan (*url dan nama jurnal, penerbit, url paten, keterangan sejenis lainnya*)
2	Prosiding dalam pertemuan ilmiah Internasional	sudah terbit/sudah dilaksanakan	Seminar Nasional Riset Terapan (SNRT) 2020
2	Prosiding dalam pertemuan ilmiah Internasional	sudah terbit/sudah dilaksanakan	-
2	Prosiding dalam pertemuan ilmiah Internasional	sudah terbit/sudah dilaksanakan	-

Luaran Tambahan

Tahun Luaran	Jenis Luaran	Status target capaian (*accepted, published, terdaftar atau granted, atau status lainnya*)	Keterangan (*url dan nama jurnal, penerbit, url paten, keterangan sejenis lainnya*)
2	Buku Ajar (ISBN)	sudah terbit	-

5. ANGGARAN

Rencana anggaran biaya penelitian mengacu pada PMK yang berlaku dengan besaran minimum dan maksimum sebagaimana diatur pada buku Panduan Penelitian dan Pengabdian kepada Masyarakat Edisi 12.

Total RAB 2 Tahun Rp. 52,500,000

Tahun 1 Total Rp. 0

Tahun 2 Total Rp. 52,500,000

Jenis Pembelanjaan	Item	Satuan	Vol.	Biaya Satuan	Total
Analisis Data	Uang Harian	OH	13	350,000	4,550,000
Bahan	Bahan Penelitian (Habis Pakai)	Unit	2	1,600,000	3,200,000
Bahan	ATK	Paket	5	250,000	1,250,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	HR Sekretariat/Administrasi Peneliti	OB	1	900,000	900,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	Biaya seminar nasional	Paket	1	3,500,000	3,500,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	Biaya Publikasi artikel di Jurnal Nasional	Paket	1	1,600,000	1,600,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	Luaran KI (paten, hak cipta dll)	Paket	1	1,000,000	1,000,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	Biaya penyusunan buku termasuk book chapter	Paket	1	17,000,000	17,000,000
Pelaporan, Luaran Wajib, dan Luaran Tambahan	Biaya Luaran Iptek lainnya (purwa rupa, TTG dll)	Paket	2	8,500,000	17,000,000
Pengumpulan Data	HR Pembantu Peneliti	OJ	1	450,000	450,000
Pengumpulan Data	HR Sekretariat/Administrasi Peneliti	OB	1	300,000	300,000
Pengumpulan Data	Uang harian rapat di dalam kantor	OH	5	350,000	1,750,000

6. HASIL PENELITIAN

A. RINGKASAN: Tuliskan secara ringkas latar belakang penelitian, tujuan dan tahapan metode penelitian, luaran yang ditargetkan, serta uraian TKT penelitian.

Tidak tersedianya waktu yang memadai bagi guru sekolah dasar di Indonesia untuk menyampaikan materi pembelajaran di dalam ruang kelas menyebabkan pembelajaran menjadi tidak efektif. Penggunaan e-learning, e-module, dan teknologi pembelajaran interaktif Compact Disk untuk membantu siswa belajar secara mandiri di luar waktu belajar formal di kelas masih memiliki kelemahan. Penelitian ini mengusulkan model media pembelajaran yang memanfaatkan teknologi mobile berbasis Smart Phone untuk membantu guru menyampaikan materi pelajaran di luar waktu belajar formal. Model media pembelajaran ini berfungsi sebagai media untuk memperkaya materi pelajaran yang tidak tuntas disampaikan di ruang kelas.

Penelitian ini menggunakan metode Penelitian R&D (Research and Development) yang terdiri atas tiga tahapan utama, yaitu: analisis persyaratan sistem, pengembangan model sistem, dan evaluasi formatif untuk menguji efektivitas model sistem.

Penelitian ini merupakan penelitian dasar, dengan TKT maksimal pada level 3. Studi Literatur mengenai teknologi yang dikembangkan telah diselesaikan, demikian juga dengan hipoteis penelitian telah dibangun. Dengan demikian TKT level 1 penelitian ini telah dituntaskan. Untuk TKT level 2, desain teoritis dan elemen-elemen dasar teknologi yang akan dikembangkan telah diketahui. Pada tahun pertama, penelitian ini telah menyelesaikan TKT level 2 yaitu membangun rancangan / model teknologi (Model Prosedural dan Model Phisikal). Pada tahun ke-2 penelitian ini dilakukan pengembangan produk dan pengujian kebenaran secara teoritis seluruh komponen-komponen teknologi yang dikembangkan melalui Validasi Ahli (expert), validasi 1-1 pengguna sistem (siswa), Ujicoba kelompok kecil pengguna (siswa), Ujicoba kelompok besar (siswa), dan pengujian sistem prototipe secara terintegrasi dengan menggunakan data dummy untuk memenuhi TKT level 3.

Luaran wajib tahun ke-1 yang telah dipenuhi pada penelitian ini berupa Artikel Ilmiah yang diterbitkan pada Jurnal Internasional bereputasi /terindeks Scopus (status: sudah terbit), serta Artikel yang diseminasikan pada seminar nasional (status: telah dilaksanakan). Adapun Luaran Tambahan yang telah dipenuhi pada Tahun ke-1 adalah Publikasi Artikel pada Jurnal Nasional Terakreditasi (status: telah terbit).

Pada tahun ke-2, luaran wajib berupa Artikel yang dideseminasikan dan diterbitkan pada Prosiding Internasional (Terindeks Scopus). Adapun luaran tambahan berupa Buku Ajar ber-ISBN sedang dalam proses Review (Pendanaan atas Luaran Tambahan ini Dibatalkan Pada Kontrak yang diamandemen). Luaran tambahan lainnya berupa Artikel yang diterbitkan pada Jurnal Nasional Terakreditasi dan HKI.

Hasil validasi expert (Desain model Media Pembelajaran) menunjukkan bahwa model media pembelajaran berbasis teknologi mobile yang dikembangkan sangat cocok untuk digunakan sebagai sumber belajar untuk pengayaan bahan ajar pasca pembelajaran di dalam ruang kelas, dengan persentase validasi rata-rata mencapai 82.8%.

B. KATA KUNCI: Tuliskan maksimal 5 kata kunci.

Pengayaan bahan ajar; Model media pembelajaran; Teknologi mobile; Kompetensi siswa; Ketuntasan belajar.

Pengisian poin C sampai dengan poin H mengikuti template berikut dan tidak dibatasi jumlah kata atau halaman

namun disarankan seringkas mungkin. Dilarang menghapus/memodifikasi template ataupun menghapus penjelasan di setiap poin.

C. HASIL PELAKSANAAN PENELITIAN: Tuliskan secara ringkas hasil pelaksanaan penelitian yang telah dicapai sesuai tahun pelaksanaan penelitian. Penyajian dapat berupa data, hasil analisis, dan capaian luaran (wajib dan atau tambahan). Seluruh hasil atau capaian yang dilaporkan harus berkaitan dengan tahapan pelaksanaan penelitian sebagaimana direncanakan pada proposal. Penyajian data dapat berupa gambar, tabel, grafik, dan sejenisnya, serta analisis didukung dengan sumber pustaka primer yang relevan dan terkini.

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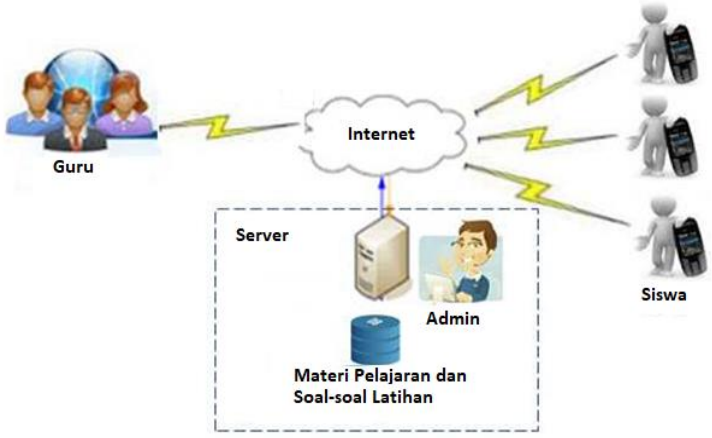
1. Konstruksi Model

Konsep model pembelajaran mengusung konsep pembelajaran campuran (*blanded learning*). Pada awal proses, siswa dan guru menyelenggarakan pembelajaran tatap muka sesuai jadwal yang ditetapkan oleh manajemen akademik di sekolah. Bahan ajar yang tidak tuntas disampaikan pada pertemuan tatap muka, didistribusikan ke siswa melalui media pembelajaran berbasis sistem teknologi *mobile*. Para siswa mempelajari materi pembeajaran dan berlatih mengerjakan soal-soal latihan melalui perangkat *smartphone* pada waktu-waktu tertentu, di bawah kendali guru mata pelajaran di luar jam belajar formal. Model media pembelajaran berbasis sistem teknologi mobile disajikan pada gambar 1.



Gambar 1. Arsitektur Media Pembelajaran Berbasis Sistem Teknologi *Mobile*

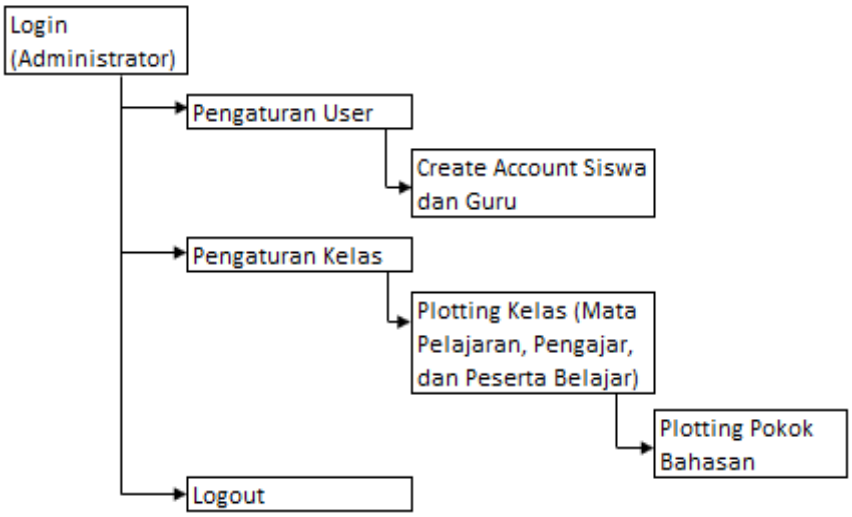
Pada gambar 1, sebuah server komputer berisi database materi pelajaran dan soal-soal latihan yang bersumber dari guru mata pelajaran ditempatkan di sekolah. Server dikelola oleh seorang Administrator Sistem. Bahan pelajaran dan soal-soal latihan didistribusikan secara berkala ke smartphone siswa melalui jaringan internet. Pendistribusian bahan ajar dan soal-soal latihan dikendalikan oleh guru mata pelajaran melalui terminal smartphone, sesuai dengan rancangan pembelajaran yang telah dipersiapkan.

Antar muka sistem aplikasi berbasis teknologi mobile terbagi dalam tiga bagian, yaitu: antarmuka pada sisi administrator sistem (gambar 2), antar muka untuk guru mata pelajaran (gambar 3), dan antar muka untuk siswa (gambar 4). Operasi sistem dibagi ke dalam 3 tahapan utama, yaitu: tahapan registrasi user dan kelas yang dilakukan oleh Administrator Sistem; tahapan persiapan pembelajaran yang dilakukan oleh guru; dan tahapan pembelajaran yang dilakukan oleh siswa.

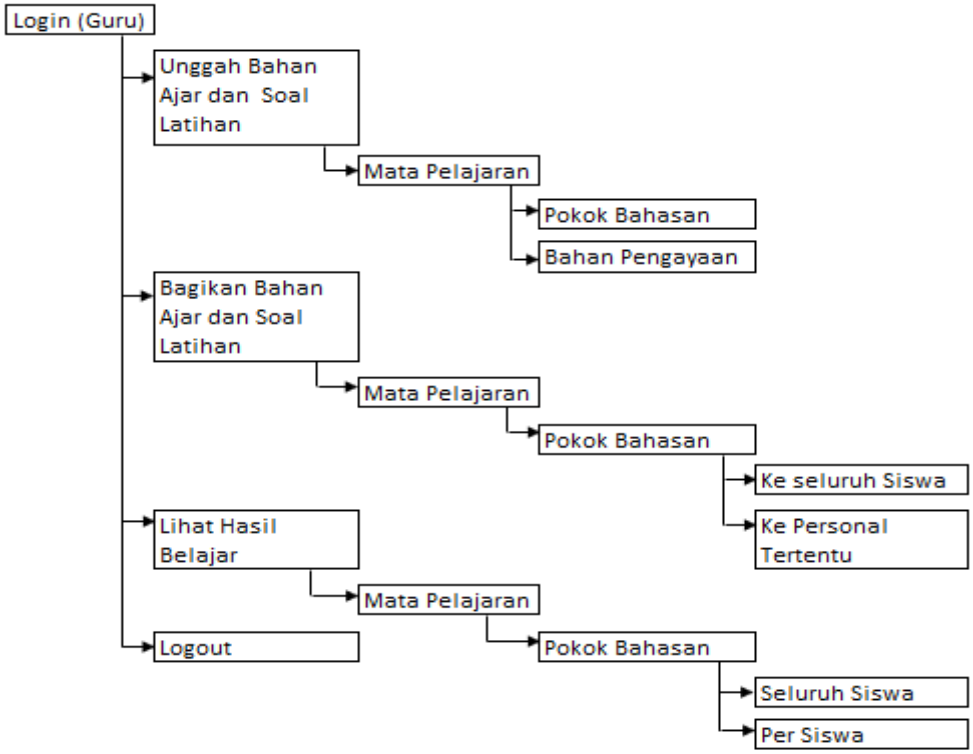
Pada **tahap awal** (registrasi user dan kelas), administrator sistem mendaftarkan semua peserta belajar dan pengajar ke dalam sistem untuk mendapatkan account autentifikasi (gambar 2). Pada setiap awal semester, administrator sistem juga membuat perencanaan kelas, dengan mendaftarkan dan memberikan identitas unik pada setiap mata pelajaran dan sub pokok bahasan yang akan diajarkan pada semua kelas, termasuk menetapkan peserta belajar dan guru pengajar untuk setiap kelas yang dibentuk, sehingga setiap kelas mata pelajaran dan sub pokok bahasan pada setiap tingkatan kelas memiliki identitas unik.

Pada **tahap ke-2** (tahapan persiapan pembelajaran), guru mata pelajaran mengunggah bahan ajar utama dan bahan ajar pengayaan berbentuk file teks atau file tutorial berbasis multimedia, serta soal-soal latihan pada setiap kelas yang terbentuk (gambar 3). Selanjutnya, secara berkala guru mata pelajaran mendistribusikan bahan ajar beserta soal-soal latihan tersebut melalui jaringan komunikasi global kepada siswa sesuai dengan jadwal pembelajaran yang telah direncanakan. Pendistribusian bahan ajar secara berkala kepada siswa didasarkan pada hasil kajian secara psikologi bahwa anak-anak usian kurang dari 12 tahun cenderung untuk menafsirkan pesan-pesan menurut bagian demi bagian daripada secara keseluruhan [1]. Pendistribusian bahan ajar dan soal-soal latihan dapat

dilakukan secara serempak kepada semua peserta belajar pada sebuah kelas tertentu, atau untuk alasan tertentu hanya ditujukan kepada siswa tertentu yang dinginkan. Dengan konsep seperti ini, guru tetap memegang peran sentral dalam mengendalikan proses pembelajaran, sebagaimana yang dikemukakan oleh Kristiantari [2] bahwa peran guru dalam proses pembelajaran tetaplah menjadi kunci sukses sebuah pendidikan. Hal ini juga sejalan dengan pandangan Alawiyah [3] bahwa sistem kurikulum tidak akan bermakna bila tidak didukung oleh kemampuan guru dalam mengendalikan sistem pembelajaran. Pada modul ini guru juga dapat melihat hasil umpan balik pembelajaran (hasil tes siswa) untuk setiap sub pokok bahasan yang telah dipelajari siswa, baik hasil tes siswa secara keseluruhan maupun untuk siswa tertentu, untuk menjadi acuan bagi guru dalam mengevaluasi sistem pembelajaran yang diselenggarakan. Hal ini sejalan dengan pandangan Purnomo [4] bahwa peran penilaian dalam pembelajaran diperlukan untuk mengukur apa yang siswa ketahui dan perlukan berdasarkan pada data yang dikumpulkan yang berfungsi sebagai bukti belajar. Di samping itu, penilaian digunakan untuk menginformasikan kepada guru untuk merefleksikan pengajarannya dan membuat perbaikan menuju tujuan yang ingin dicapai

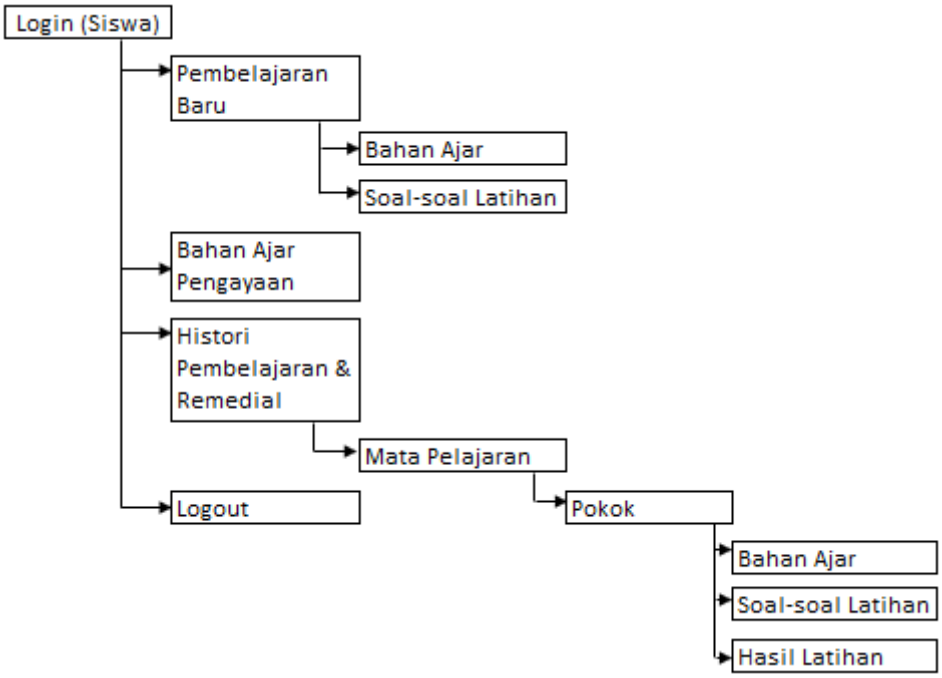


Gambar 2. Antarmuka pada Sisi Administrator Sistem



Gambar 3. Antarmuka pada Sisi Guru

Tahapan ke-3 adalah tahapan inti sistem pembelajaran berbasis teknologi mobile, yaitu tahapan pembelajaran secara mandiri yang dilakukan oleh siswa melalui perangkat smartphone. Setiap bahan ajar dan soal-soal latihan yang didistribusikan oleh guru mata pelajaran pada sebuah kelas tertentu akan diketahui oleh siswa melalui antarmuka menu "Pembelajaran Baru" (gambar 4). Siswa mengakses file pembelajaran baru, mempelajarinya secara mandiri, dan berlatih menjawab soal-soal latihan pada setiap akhir sebuah sesi pembelajaran. Siswa dapat melihat hasil sementara yang diperolehnya pada proses latihan (menjawab soal-soal latihan), dan diberikan kesempatan beberapa kali untuk memulai kembali mempelajari sub pokok bahasan tertentu (remedial) jika nilai tes belum mencapai standar ketuntasan yang ditetapkan oleh guru mata pelajaran, melalui antarmuka menu "Histori Pembelajaran dan Remedial". Para siswa juga berkesempatan mempelajari bahan ajar pengayaan melalui modul pengayaan untuk lebih memperdalam penguasaan materi pada sub pokok bahasan tertentu sebelum mengikuti proses remedial. Ketersediaan modul belajar dapat meningkatkan hasil belajar siswa seoptimal mungkin, baik dari segi kuantitas maupun kualitas [5].



Gambar 4. Antarmuka pada Sisi Siswa

2. Pengujian Efektivitas Produk (Uji Formatif Model)

Telaah Pakar/Ahli (*Expert Validation*)

Setelah produk media pembelajaran dikembangkan, langkah selanjutnya adalah proses penilaian oleh ahli (pakar media pembelajaran). Masukan yang diberikan oleh ahli digunakan sebagai referensi untuk melakukan perbaikan pada produk media pembelajaran yang dikembangkan. Penilaian oleh ahli dilakukan dengan menggunakan kuesioner. Rentang penilaian adalah 1-4 dengan interpretasi 4 = tepat, 3 = cukup tepat, 2 = tidak akurat, dan 1 = tidak tepat. Setiap nilai yang diberikan ditransformasikan menjadi persentase dengan uraian nilai 85 - 100 = sangat layak tidak perlu direvisi, 75 - 84 = layak tidak perlu direvisi, 55 - 74 = tidak cukup perlu direvisi, dan 0 - 54 = tidak layak perlu direvisi. Dalam kuesioner, pakar dapat memberikan saran, kritik, dan masukan pada produk media pembelajaran yang dikembangkan.

Butir-butir instrumen untuk mengevaluasi desain instruksional adalah yang berkaitan dengan aspek ketepatan rumusan tujuan pembelajaran, alat Evaluasi, serta strategi pembelajaran. untuk Evaluasi Media Pembelajaran berbasis Teknologi Informasi menggunakan butir-butir instrumen yang berkaitan dengan aspek tampilan komunikasi vizual, *Functionality*, serta *Usability*). Tabel 1 menyajikan hasil evaluasi oleh para ahli terhadap produk desain instruksional yang dikembangkan.

Table 1: Hasil Validasi Pakar (Expert)

Pakar (Expert)	**Skor**
Instructional Design Expert	83.5%
Media Expert	82.1%
Rerata	**82.8%**

Tabel 1 menyajikan Hasil penilaian ahli desain instruksional mencapai rata-rata 83.50%, menunjukkan desain instruksional berada pada kategori layak digunakan. Demikian dengan hasil penilaian ahli media pembelajaran berbasis Teknologi Informasi mencapai 82.10%, menunjukkan bahwa media pembelajaran berbasis teknologi mobile juga layak digunakan. Nilai rata-rata hasil validasi para ahli terhadap produk pembelajaran berbasis teknologi mobile yang dikembangkan mencapai 82,80%, menunjukkan bahwa produk dalam kategori efektif dan layak digunakan. Hasil validasi produk media pembelajaran belum mencapai 100% karena masih terdapat kekurangan pada produk, seperti kurangnya gambar, animasi dan video yang mendukung materi Pembelajaran. Masukan daru para ahli dijadikan dasar untuk menyempurnakan Produk.

Evaluasi Satu-satu Oleh Peserta Didik, Uji Kelompok Kecil, dan Uji Kelompok Besar

Setelah dilakukan validasi dan revisi berdasarkan masukan ahli, produk media pembelajaran diujicobakan kepada siswa. Pengujian efektivitas Produk Software Pembelajaran Berbasis Mobile (secara kuantitatif) dilakukan dengan membandingkan signifikan tidaknya nilai hasil belajar peserta didik pada *Posttest* dengan *Pretest* (pencapaian standar kompetensi yang telah ditetapkan) pada saat ujicoba pada siswa dalam kelompok Besar (10 siswa). Adapun hasil uji secara kualitatif penerapan produk pembelajaran terhadap peserta didik dalam kelompok besar menunjukkan sekitar 85% dari 10 responden menyatakan bahwa produk pembelajaran sangat memotivasi siswa dalam belajar secara mandiri sehingga target pencapaian pembelajaran dapat dicapai. Pernyataan ini didukung oleh data prosentase ketuntasan belajar pada bidang kompetensi yang diujikan (tabel 2), yaitu rata-rata mencapai lebih dari 95% pada hasil posttest.

Table 2: Hasil Evaluasi Oleh Peserta Didik

Pretest Completeness Average (%)	**Posttest Completeness Average (%)**	**Instructional Product Assessment Results (%)**
54.60	95.50	Attractive Display: 80.70 User Friendly: 80.10 Material Presentation: 82,90 Rata-rata: 81.20

Proses ujicoba juga dilakukan pada siswa secara individu (uji satu-satu) dan pada siswa dalam kelompok kecil. Uji coba individu dilakukan dengan melibatkan 3 siswa dan uji coba kelompok kecil melibatkan 5 siswa. Siswa dipilih secara acak, terdapat siswa yang hasil belajarnya tinggi, siswa yang hasil belajarnya sedang, dan siswa yang hasil belajarnya rendah. Setelah diyakini heterogen, siswa diminta memberikan tanggapan, saran dan masukan dengan cara mengisi angket kelayakan yang telah diberikan (berkaitan dengan aspek Attractive Display, User Friendly, dan Material Presentation). Hasil akhir respon siswa terhadap produk media pembelajaran dapat dilihat pada tabel 2.

Ada dua aspek penilaian yang dilakukan siswa terhadap produk media pembelajaran yaitu aspek non fungsional (tampilan menarik dan user friendly) dan aspek fungsional (penyajian materi). Pada aspek non fungsional (tampilan fisik) siswa menilai bahwa produk media pembelajaran yang dikembangkan memiliki tampilan yang menarik (hasil penilaian mencapai 80,7%) dan mudah digunakan (hasil penilaian mencapai 80,1%). Pada aspek fungsional produk media pembelajaran berbasis teknologi mobile yang dikembangkan dapat menyajikan bahan ajar secara efektif (dapat digunakan siswa untuk belajar kapanpun dan dimanapun, serta dapat menyajikan materi pembelajaran yang mudah dipahami siswa), dengan hasil penilaian mencapai 82,9%. Hasil ini sejalan dengan temuan Supriyono et al. [6] yang menyarankan bahwa aplikasi pembelajaran berbasis teknologi mobile yang praktis dan efektif digunakan dalam pembelajaran, dan temuan Kim, et al. [7] yang merekomendasikan penggunaan aplikasi smartphone sebagai alat bantu belajar yang efektif, dan dapat digunakan sebagai pelengkap pembelajaran tradisional. Temuan dalam penelitian ini juga sejalan dengan temuan Amirullah

dan Susilo [8] yang mengembangkan media pembelajaran berbasis smartphone Android, dan menemukan bahwa media pembelajaran berbasis teknologi mobile sudah sesuai untuk digunakan sebagai sumber belajar bagi siswa.

...

D. **STATUS LUARAN**: Tuliskan jenis, identitas dan status ketercapaian setiap luaran wajib dan luaran tambahan (jika ada) yang dijanjikan pada tahun pelaksanaan penelitian. Jenis luaran dapat berupa publikasi, perolehan kekayaan intelektual, hasil pengujian atau luaran lainnya yang telah dijanjikan pada proposal. Uraian status luaran harus didukung dengan bukti kemajuan ketercapaian luaran sesuai dengan luaran yang dijanjikan. Lengkapi isian jenis luaran yang dijanjikan serta mengunggah bukti dokumen ketercapaian luaran wajib dan luaran tambahan melalui Simlitabmas mengikuti format sebagaimana terlihat pada bagian isian luaran

Status luaran yang dijanjikan pada pada tahun ke-2 penelitian ini disajikan pada tabel 3.

Tabel 3. Status Luaran Penelitian Tahun ke-2

No	Jenis Luaran	Status Luaran	Keterangan
1	**LUARAN WAJIB**: Publikasi Prosiding Internasional	*Sudah Terbit*	Proceedings of the First National Seminar Universitas Sari Mulia, NS-UNISM 2019, 23rd November 2019, Banjarmasin, South Kalimantan, Indonesia Terbit di EUDL pada: 22-07-2020 Publisher: EAI (Terindeks Scopus) ISBN: 978-1-63190-257-4 ISSN: 2593-7650 Judul: Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms https://eudl.eu/proceedings/NS-UNISM/2019?articles_page=5
2	**LUARAN TAMBAHAN:** Buku Ajar	Proses Review	Judul: ANALISIS DAN PEMODELAN SISTEM INFORMASI Keterangan: Berdasarkan Kontrak Tahun ke-1, Luaran tambahan ini memperoleh Pendanaan Tambahan. Namun pada Kontrak Tahun ke-2 (Amandemen), Pendanaan untuk luaran tambahan ini dibatalkan. Dengan demikian, besar kemungkinan Luaran Tambahan ini tidak terealisasi.
3	**LUARAN LAINNYA:** - Publikasi Artikel pada Jurnal Nasional Terakreditasi - HKI atas Artikel Ilmiah	Telah berstatus ACCEPTED Sedang dalam proses pengajuan	**Jurnal JUTISI (Sinta-5)** **Volume 9 No. 3, Desember 2020** Rancangan Aplikasi Pembelajaran Berbasis Teknologi Mobile Bagi Siswa Sekolah Dasar **Judul Artikel**: Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms

...

E. **PERAN MITRA:** Tuliskan realisasi kerjasama dan kontribusi Mitra baik *in-kind* maupun *in-cash* (jika ada). Bukti pendukung realisasi kerjasama dan realisasi kontribusi mitra dilaporkan sesuai dengan kondisi yang sebenarnya. Bukti dokumen realisasi kerjasama dengan Mitra diunggah melalui Simlitabmas mengikuti format sebagaimana terlihat pada bagian isian mitra

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F. **KENDALA PELAKSANAAN PENELITIAN**: Tuliskan kesulitan atau hambatan yang dihadapi selama melakukan penelitian dan mencapai luaran yang dijanjikan, termasuk penjelasan jika pelaksanaan penelitian dan luaran penelitian tidak sesuai dengan yang direncanakan atau dijanjikan.

Kendala yang dihadapi dalam penelitian tahun ke-2 ini adalah dalam ujicoba Produk (uji formatif), khususnya ujicoba pada peserta didik, baik uji 1-1 maupun uji coba kelompok kecil dan kelompok besar. Rancangan awal penelitian adalah Model Blanded Learning, dimana ujicoba penerapan produk pembelajaran dilakukan untuk dua sesi, yaitu Sesi Tatap Muka Langsung dan sesi pembelajaran secara mandiri. Namun karena situasi pandemi Covid-19 yang membatasi pertemuan tatap muka langsung, sehingga pertemuan tatap muka hanya bisa dilakukan dengan media lain secara daring, dimana para siswa belum terbiasa dengan situasi seperti ini. Hal ini dikhawatirkan akan berpengaruh pada kevalidan penilaian produk. Demikian juga dengan jumlah responden yang diikutsertakan dalam ujicoba sistem, tidak lagi sesuai dengan rencana awal. Ujicoba kelompok kecil yang sedianya diikuti oleh 9 hingga 15 peserta didik, hanya dapat diikuti oleh 5 orang peserta didik. Sedangkan pada uji coba kelompok besar, sedianya akan menggunakan 20 responden, hanya diikuti oleh 10 peserta didik. Perlu kajian lebih jauh atas perubahan jumlah responden tersebut, terkait dengan apakah pengurangan jumlah responden akan mempengaruhi kevalidan hasil pengujian. Bahkan, terdapat satu kegiatan ujicoba lapangan (integrasi sistem) yang tidak dapat direalisasikan, yaitu Uji coba lapangan (summatif) yang melibatkan jumlah siswa dalam kelompok sangat besar (orientasi kelas/beberapa kelas).

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G. **RENCANA TINDAK LANJUT PENELITIAN:** Tuliskan dan uraikan rencana tindaklanjut penelitian selanjutnya dengan melihat hasil penelitian yang telah diperoleh. Jika ada target yang belum diselesaikan pada akhir tahun pelaksanaan penelitian, pada bagian ini dapat dituliskan rencana penyelesaian target yang belum tercapai tersebut.

..... Hingga pada pelaporan kemajuan Penelitian tahun ke-2 ini, kemajuan penelitian telah mencapai sekitar hanya tersisa dua kegiatan pokok, yaitu: penerbitan buku ajar dan HKI, serta seminar dan pelaporan akhir kegiatan penelitian. Skim Penelitian Dasar yang dilaksanakan selama 2 tahun (multi tahun) ini, juga akan dilanjutkan ke Skim Penelitian Lanjutan berupa penelitian Terapan, yang rencananya juga akan dilaksanakan selama 2 tahun (multi tahun). Pada penelitian Terapan tersebut akan dikembangkan sebuah modul tambahan berupa sistem teknologi pembelajaran berbasis mobile yang dapat terkoneksi pada perangkat mobile orang tua/wali siswa secara real time. Sistem ini akan diuji coba secara terbatas pada situasi yang sebenarnya, untuk melakukan pembuktian sejauhmana dampak dari teknologi yang telah didesain dapat menyelesaikan masalah nyata di lapangan. Selanjutnya produk teknologi akhir yang dihasilkan dan telah diujicoba di lapangan, didaftarkan untuk mendapatkan HKI / Paten. Road Map pengembangan penelitian lebih lanjut disajikan pada gambar 5.

Gambar 5. Peta Jalan Penelitian Secara Berkelanjutan

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H. **DAFTAR PUSTAKA:** Penyusunan Daftar Pustaka berdasarkan sistem nomor sesuai dengan urutan pengutipan. Hanya pustaka yang disitasi pada laporan akhir yang dicantumkan dalam Daftar Pustaka.

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Dokumen pendukung luaran Wajib #1

Luaran dijanjikan: Prosiding dalam pertemuan ilmiah Internasional

Target: sudah terbit/sudah dilaksanakan
Dicapai: Published

Dokumen wajib diunggah:
1. Artikel yang terbit

Dokumen sudah diunggah:
1. Artikel yang terbit

Dokumen belum diunggah:
- Sudah lengkap

Peran penulis: first author
Nama Konferensi/Seminar: NS-UNISM 2019
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Judul artikel: Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms

Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms

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Abstract. The unavailability of adequate time for elementary school teachers in Indonesia to deliver learning material in the classroom causes learning to be ineffective. Use of e-learning, e-module, and Compact Disk Interactive Learning Technology to help students learn independently outside the formal study time in class still has disadvantages. This paper proposes a learning media model that utilizes Smart Phone-based mobile technology to help teachers deliver subject matter outside of formal learning time. This media serves as a medium for enriching subject matter that is not completed delivered in the classroom. A database server is placed in the school, containing subject matter as well as practice questions provided by the teacher according to the prepared learning plan. There is a smart feature that functions to manage learning materials, practice questions, and distribute them to students' smart phones under the control of the teacher's mobile device. Students learn through their Smart Phone-based mobile devices.

Keywords: Enrichment of Teaching Materials, Learning Media Model, Mobile Technology, Student Competence

1 Introduction

In planning learning in school, time management in class is a complex and difficult task for teachers, even though on the surface it seems quite simple and practical. It often happens to teachers who are inexperienced, find themselves having to race to complete a variety of topics in the shortest time possible in order to convey the entire contents of the targeted learning. Unfortunately, what seems to them to be an efficient use of time often results in little in student learning, if any. This shows that effective use of time is as important as the amount of time spent on a topic [1].

In general, elementary schools in Indonesia provide education about 6 hours per day for 180 days every year. The total time available for teaching is basically determined. Of the 6 hours available, there must be time to teach various subjects, plus time for rest, sports (physical education), switching between class hours, announcements and so on. Therefore, there is a lot of lost time allocation. The time allocated and used for a specific task is closely related to student academic achievement. The findings by the researchers show that the classroom as a place where students spend most of their time engaging in academic activities

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is the class that should be a place for students to get academic achievement. However, it often happens that part of the school time is used for lunch, breaks, meetings, and other extracurricular activities which reduce the time for academic activities. This has an impact on the inaccuracy of delivery of teaching materials by teachers to students.

The methods of maximizing the usual time allocation include preventing late teaching and early termination, preventing disruption during the learning process, handling routine procedures smoothly and quickly, minimizing the time spent on developing student discipline, and using busy time effectively [1]. If the time for educational activities in the classroom still cannot be fulfilled, then another effort that can be done by the teacher is to extend the time through homework assignments. Other efforts commonly done by students are to take part in learning activities outside of formal learning time, such as tutoring in school outside of formal study time or in non-formal institutions, and to study independently with the support of the family environment. However, efforts to extend study time outside formal learning time are constrained by the family environment (economic factors and various other non-economic factors) that do not support the process of enriching teaching materials after learning in class [1].

Various studies have been conducted to create learning media in an effort to increase the effectiveness of students learning independently. Rosenberg in [2] introduced the concept of "cyber teaching", namely the teaching process carried out using the internet. Another term that is popular today is e-learning, which is a learning model using communication and information technology media, especially the internet, with the principle of e-pedagogy in the independent learning process [3]. E-learning with the concept of Distance Learning that is supported by the internet network can support the concept of learning anytime and anywhere, but has an impact on the aspects of information obtained. That is not guaranteed the accuracy of information from the internet so that it is very dangerous if students (especially elementary school students who immature) lacks a critical attitude to the information obtained.

Suarsana [4] introduced a problem-oriented e-module to improve students' thinking skills. The e-module guides students to look for problem solving independently, thus providing a concrete experience in problem solving. The e-module fosters and trains higher-order thinking skills including critical thinking skills. Learning to use modules greatly values individual differences, so students can learn according to their ability levels. However, learning by using modules has disadvantages such as: high material development costs and long development time, and requires high discipline of learning and motivation that students may not have in general and students who are not yet mature in particular.

Wulandari [5] developed an interactive Compact Disk (CD)-based learning media to provide a variety or variation of learning, especially for the independent learning process, so students are more interested and motivated to learn. Waskito [6] has also developed interactive CD-based learning media for elementary school mathematics lessons, which combine multimedia elements (text, sound, images, and video) in its development. Multimedia-based interactive learning CDs provide a variety or variety of learning, especially for independent learning processes, so students will be more interested and motivated in learning. However, to be able to run interactive learning CD-based applications requires hardware such as a Computer Central Processing Unit (CPU) and CD-R / RW, so it is not efficient to be used to study anytime and anywhere.

The development of Information and Communication Technology especially smartphone technology is currently growing rapidly. Many early childhood or elementary school students use smartphones as a medium to communicate with parents when outside the home. Smartphones are also favored by elementary school age children for entertainment, especially

for playing (games). On the one hand children tend to use smartphones with game features (games) for a long time (at any time) so that it can interfere with learning activities because they prefer playing games rather than learning [7] [8], but on the other hand smartphone technology that carries the concept of practicality (mobile) can be used for a variety of academic activities that are of use value if managed intelligently, especially as an effective learning media for children. Supriyono, et al. [9] examined the use of Android-based mobile devices as a medium for learning Hadith Sciences. The mobile-based application that was built has two main features, namely features for independent learning and features for assessment (practice questions). This application is also equipped with a search facility for certain topics that you want to learn. Students can learn anytime and anywhere by utilizing this Android-based learning application. User test results show that this mobile technology-based application is practical and effective in studying Hadith. Puspa, Nugroho and Puspitarini [10] have examined the use of mobile technology-based learning media in learning systems independently. In this study Android-based game applications were made as a medium for early childhood learning. This application provides features for learning to read and recognize objects and features for writing or drawing, all of which are packaged in the form of interesting games. User test results show that this Android-based mobile application can develop thinking power and creativity, with an interface that is easy to understand and operate at an early age. Pahrudin [11] has also developed a Physics Summary Book based on smartphone applications, which can be used by students to learn and practice solving practice questions independently without being controlled by subject teachers. Posttest test results in the experimental class showed the Minimum completeness Criteria which reached 93.75%, so it was concluded that the smartphone-based learning application is very feasible to use as an effective learning media.

This paper proposes a learning media model that utilizes mobile technology (smartphone) to help teachers deliver subject matter outside of formal learning time, as a form of enriching subject matter that is not completely delivered in the classroom due to time constraints. Subject material in the form of teaching materials and practice questions delivered to students, distributed in a controlled manner (gradually) through a global communication network to the smartphone device of students in accordance with the stages of learning contained in the learning design. Thus, the learning strategy offered in this mobile-based learning media technology is independent learning that is controlled by the teacher.

2 Research Method

This study uses the Research and Development Method (R&D), adapting the stages of Research and Development proposed by [12]. The steps of the study consist of First, Analysis of system requirements involving learning designers, institutional management, and college graduates or the business world as graduate users [12]. They are included in the formulation of competencies in the field of software modeling needed in learning design. Second: Development of learning design, following the procedure for developing learning designs proposed by [13]. The development stage consists of two main steps, namely identifying learning needs and developing learning designs. The advanced PBL concept is implemented at the scene of preparing the learning strategy. Third: Formative Evaluation to test the effectiveness of the model.

Formative Evaluation, consisting of (1) product expert validation (learning aspects and aspects of learning material), and (2) Product of Mobile Technology Application trials (Individual learners and small groups). At the end of each trial phase, data analysis and product revisions are carried out based on the input obtained from the experiment.

3 The Proposed Model Concepts

Learning strategies carry the concept of mixed learning (blended learning). At the beginning of the process, students and teachers conduct face-to-face learning in class according to the schedule set by academic management in the school. Teaching materials that are not finished are delivered in class, distributed to students through learning media based on mobile technology systems. Students study learning material and practice working on practice questions through a smartphone device at certain times, under the control of the subject teacher outside formal study hours. The architecture of learning media based on mobile technology systems is presented in Figure 1.

Fig.1. Architecture of Learning Media Based on Mobile Technology Systems

In Figure 1, a computer server containing a database of subject matter and practice questions sourced from the subject teacher is placed in the school. The server is managed by a System Administrator. Study materials and practice questions are regularly distributed to students' smartphones via the internet. The distribution of teaching materials and practice questions is controlled by the subject teacher through the smartphone terminal, in accordance with the learning design that has been prepared.

The application interface of a mobile technology-based application is divided into three main modules, namely: the interface module on the system administrator side (figure 2), the interface module for subject teachers (picture 3), and the interface module for students (picture 4).

The operation of the system is divided into 3 main stages, namely the stage of user registration by and classes conducted by the System Administrator, the stages of learning preparation conducted by the teacher, and the stages of learning conducted by students. In the initial stages (user and class registration), the system administrator registers all study participants and instructors into the system to get an authentication account (figure 2). At the beginning of each semester, the system administrator also makes class plans, by registering and giving a unique identity to each subject and sub-subjects to be taught in all classes,

including assigning study participants and instructors to each class that is formed, so that each eye class lessons and subtopics at each grade level have a unique identity.

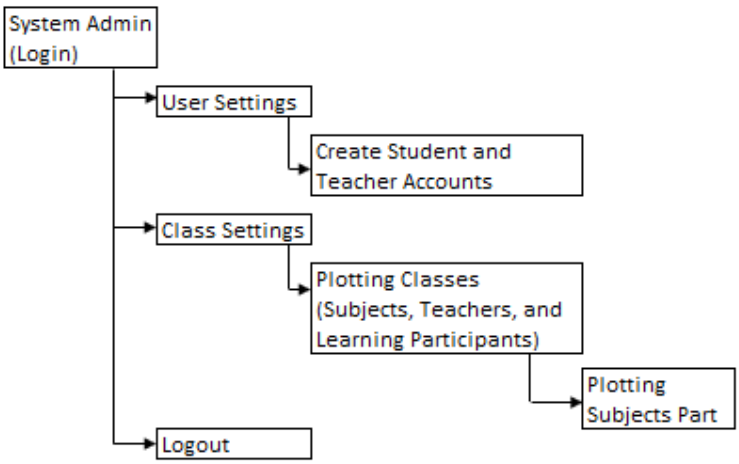

Fig.2. Site Map Interface on the System Administrator Side

In the second stage (the preparation phase of learning), the subject teacher uploads the main teaching materials and enrichment teaching materials in the form of text files or multimedia-based tutorial files, as well as practice questions for each class that is formed (figure 3). Furthermore, subject teachers periodically distribute teaching materials along with practice questions through a global communication network to students in accordance with the planned learning schedule. The distribution of teaching materials and practice questions can be done simultaneously to all participants studying in a particular class, or for some reason only addressed to certain students who are wanted. With concepts like this, the teacher still holds a central role in controlling the learning process. In this module the teacher can also see the results of learning feedback (student test results) for each sub subject that students have studied, both overall student test results and for certain students, to be a reference for teachers in evaluating the learning system that is held.

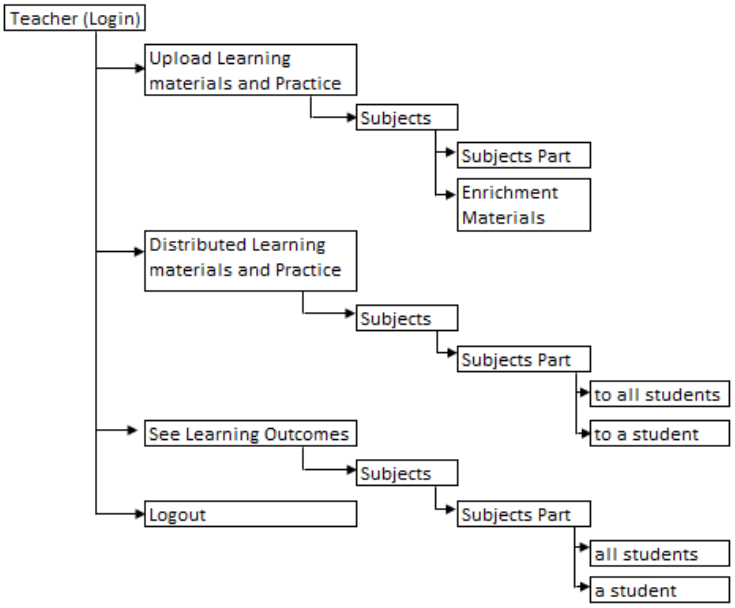

Fig.3. Site Map Interface on the Teacher's Side

The third stage is the core stages of a learning system based on mobile technology, namely the stages of independent learning carried out by students through a smartphone device. Each teaching material and practice questions distributed by subject teachers in a particular class will be known by students through the "New Learning" menu interface (figure 4). Students access new learning files, study them independently, and practice answering practice questions at the end of each learning session. Students can see the interim results obtained in the practice process (answering practice questions), and are given the opportunity several times to restart studying certain sub topics (remedial) if the test scores have not yet reached the mastery standards set by the subject teacher, through the interface "Learning and Remedial History" menu. Students also have the opportunity to learn enrichment teaching materials to further deepen mastery of the material in certain sub-subjects before following the remedial process.

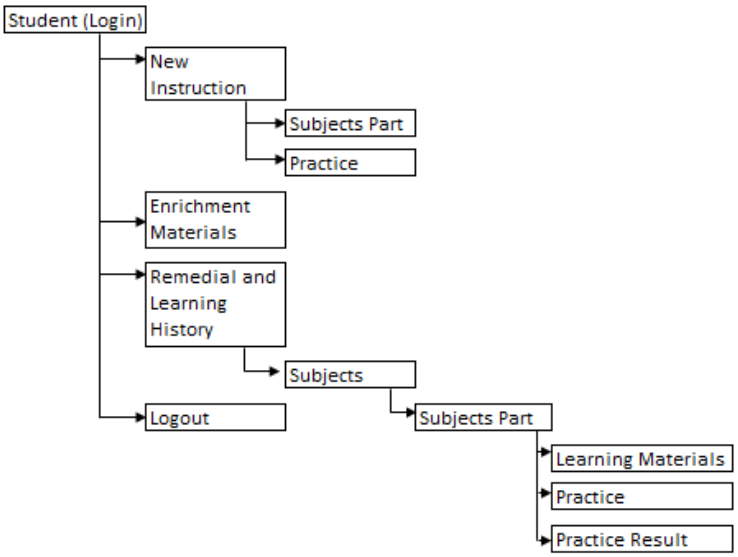

Fig.4. Site Map Interface on Student Side

This research was carried out from January to October 2019, with a total of 100 samples. We divided the data into two groups consisting of 'no CP' (50 data without CP) and 'with CP'(50 data with CP intervention).

4 Results and Discussion

After the draft instructional media product has been developed, the next step is the assessment process by experts (media experts and learning design experts). Inputs provided by experts are used as references to make improvements to learning media product.

The expert assessment was carried out using a questionnaire adapted from 'Evaluation and Selection of Learning Resources: A Guide 2008'. The assessment range was 1-4 with an interpretation of 4 = appropriate, 3 = sufficiently appropriate, 2 = inaccurate, and 1 = inappropriate. Each value given is transformed into a percentage with a description of the value 85 - 100 = very feasible does not need to be revised, 75 - 84 = feasible does not need to be revised, 55 - 74 = inadequate need to be revised, and 0 - 54 = not feasible need revision. In the questionnaire, expert can provide suggestions, criticisms, and input on the learning media product developed. The following is presented results of expert evaluations of the instructional media product developed Table 1.

Table 1. Results of Expert Validation

Expert	Score
Media Expert	82.1%
Instructional Design Expert	83.5%
Average	82.8%

Based on the table 1, it can be explained as follows:

1. The results of the media expert's assessment obtained a value of 82.1%, indicating that the instructional media product developed were in the category of proper use.
2. The assessment of Instructional design experts on instructional media product obtained a value of 83.5%, in the category worthy of use.
3. Overall the average value of the instructional media product validation developed is 82, 8%. This value is in the category worthy of use.

Results of the validation in table 1, showing that instructional media product based on mobile technology are very suitable to be used as instructional resources. The instructional media product validation percentage result has not reached 100% because there are still shortcomings of the product, such as the lack of images, animation and videos that support the material. The following is expert advice as a reference for improving the instructional media product. After validation and revision based on expert input, the instructional media product was tested on students. The trial process consists of two stages: Individual learners and small groups. Individual trials were conducted involving 3 students and a large group trial involved 9 students. The students were selected randomly, where there were students who had high learning outcomes, students who had moderate learning outcomes, and students who had low learning outcomes. After being believed to be heterogeneous, students were asked to provide responses, suggestions and input by filling out the feasibility questionnaire given previously. The last results of student responses (large group trial) to the instructional media product after obtaining suggestions and input at the individual learner trial can be seen in table 2.

Table 2. Results of Student Responses

Aspect	Results
Attractive Display	80.7%
User Friendly	80.1%
Material Presentation	82.9
Average	81.2%

There are two aspects of assessment conducted by students on instructional media products, namely non-functional aspects (attractive display and user friendly) and functional aspects (material presentation). In the non-functional aspect (physical appearance), students assess that the instructional media product developed has an attractive appearance (the assessment results reach 80.7%) and easy to use (the assessment results reach 80.1%). In the functional aspects instructional media products based on mobile technology developed can present teaching materials effectively (can be used by students to learn anytime and anywhere, and can present learning materials that are easily understood by students), with an assessment result reaching 82.9%. These results are in line with the findings of [9] who suggested that practical and effective mobile technology-based learning applications are used in learning, and the findings of [14] which recommends the use of smartphone applications as an effective learning aid, and can be used as a complement to traditional learning. The findings in this study are also in line with the findings of [15] who developed an Android smartphone-based learning media, and found that learning media based on mobile technology was appropriate to be used as a learning resource for students.

5 Conclusions

The results of student responses at the large group trial shows that the instructional media product based on mobile technology is very feasible to use as an instructional resource to enriching teaching material for Primary School Student post-learning in the classrooms. The result obtained an average value of 81.2%.

The limitation of this research is that in the product evaluation process there has not been a study involving teacher perceptions as an inseparable part in the mobile technology-based learning system in elementary schools.

6 Acknowledgments

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Dokumen pendukung luaran Wajib #2

Luaran dijanjikan: Prosiding dalam pertemuan ilmiah Internasional

Target: sudah terbit/sudah dilaksanakan
Dicapai: Published

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Judul artikel: Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms

Instructional Media Model Based on Mobile Technology to Enriching Teaching Material for Primary School Students in Indonesia Post-Learning in the Classrooms

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Abstract. The unavailability of adequate time for elementary school teachers in Indonesia to deliver learning material in the classroom causes learning to be ineffective. Use of e-learning, e-module, and Compact Disk Interactive Learning Technology to help students learn independently outside the formal study time in class still has disadvantages. This paper proposes a learning media model that utilizes Smart Phone-based mobile technology to help teachers deliver subject matter outside of formal learning time. This media serves as a medium for enriching subject matter that is not completed delivered in the classroom. A database server is placed in the school, containing subject matter as well as practice questions provided by the teacher according to the prepared learning plan. There is a smart feature that functions to manage learning materials, practice questions, and distribute them to students' smart phones under the control of the teacher's mobile device. Students learn through their Smart Phone-based mobile devices.

Keywords: Enrichment of Teaching Materials, Learning Media Model, Mobile Technology, Student Competence

1 Introduction

In planning learning in school, time management in class is a complex and difficult task for teachers, even though on the surface it seems quite simple and practical. It often happens to teachers who are inexperienced, find themselves having to race to complete a variety of topics in the shortest time possible in order to convey the entire contents of the targeted learning. Unfortunately, what seems to them to be an efficient use of time often results in little in student learning, if any. This shows that effective use of time is as important as the amount of time spent on a topic [1].

In general, elementary schools in Indonesia provide education about 6 hours per day for 180 days every year. The total time available for teaching is basically determined. Of the 6 hours available, there must be time to teach various subjects, plus time for rest, sports (physical education), switching between class hours, announcements and so on. Therefore, there is a lot of lost time allocation. The time allocated and used for a specific task is closely related to student academic achievement. The findings by the researchers show that the classroom as a place where students spend most of their time engaging in academic activities

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is the class that should be a place for students to get academic achievement. However, it often happens that part of the school time is used for lunch, breaks, meetings, and other extracurricular activities which reduce the time for academic activities. This has an impact on the inaccuracy of delivery of teaching materials by teachers to students.

The methods of maximizing the usual time allocation include preventing late teaching and early termination, preventing disruption during the learning process, handling routine procedures smoothly and quickly, minimizing the time spent on developing student discipline, and using busy time effectively [1]. If the time for educational activities in the classroom still cannot be fulfilled, then another effort that can be done by the teacher is to extend the time through homework assignments. Other efforts commonly done by students are to take part in learning activities outside of formal learning time, such as tutoring in school outside of formal study time or in non-formal institutions, and to study independently with the support of the family environment. However, efforts to extend study time outside formal learning time are constrained by the family environment (economic factors and various other non-economic factors) that do not support the process of enriching teaching materials after learning in class [1].

Various studies have been conducted to create learning media in an effort to increase the effectiveness of students learning independently. Rosenberg in [2] introduced the concept of "cyber teaching", namely the teaching process carried out using the internet. Another term that is popular today is e-learning, which is a learning model using communication and information technology media, especially the internet, with the principle of e-pedagogy in the independent learning process [3]. E-learning with the concept of Distance Learning that is supported by the internet network can support the concept of learning anytime and anywhere, but has an impact on the aspects of information obtained. That is not guaranteed the accuracy of information from the internet so that it is very dangerous if students (especially elementary school students who immature) lacks a critical attitude to the information obtained.

Suarsana [4] introduced a problem-oriented e-module to improve students' thinking skills. The e-module guides students to look for problem solving independently, thus providing a concrete experience in problem solving. The e-module fosters and trains higher-order thinking skills including critical thinking skills. Learning to use modules greatly values individual differences, so students can learn according to their ability levels. However, learning by using modules has disadvantages such as: high material development costs and long development time, and requires high discipline of learning and motivation that students may not have in general and students who are not yet mature in particular.

Wulandari [5] developed an interactive Compact Disk (CD)-based learning media to provide a variety or variation of learning, especially for the independent learning process, so students are more interested and motivated to learn. Waskito [6] has also developed interactive CD-based learning media for elementary school mathematics lessons, which combine multimedia elements (text, sound, images, and video) in its development. Multimedia-based interactive learning CDs provide a variety or variety of learning, especially for independent learning processes, so students will be more interested and motivated in learning. However, to be able to run interactive learning CD-based applications requires hardware such as a Computer Central Processing Unit (CPU) and CD-R / RW, so it is not efficient to be used to study anytime and anywhere.

The development of Information and Communication Technology especially smartphone technology is currently growing rapidly. Many early childhood or elementary school students use smartphones as a medium to communicate with parents when outside the home. Smartphones are also favored by elementary school age children for entertainment, especially

for playing (games). On the one hand children tend to use smartphones with game features (games) for a long time (at any time) so that it can interfere with learning activities because they prefer playing games rather than learning [7] [8], but on the other hand smartphone technology that carries the concept of practicality (mobile) can be used for a variety of academic activities that are of use value if managed intelligently, especially as an effective learning media for children. Supriyono, et al. [9] examined the use of Android-based mobile devices as a medium for learning Hadith Sciences. The mobile-based application that was built has two main features, namely features for independent learning and features for assessment (practice questions). This application is also equipped with a search facility for certain topics that you want to learn. Students can learn anytime and anywhere by utilizing this Android-based learning application. User test results show that this mobile technology-based application is practical and effective in studying Hadith. Puspa, Nugroho and Puspitarini [10] have examined the use of mobile technology-based learning media in learning systems independently. In this study Android-based game applications were made as a medium for early childhood learning. This application provides features for learning to read and recognize objects and features for writing or drawing, all of which are packaged in the form of interesting games. User test results show that this Android-based mobile application can develop thinking power and creativity, with an interface that is easy to understand and operate at an early age. Pahrudin [11] has also developed a Physics Summary Book based on smartphone applications, which can be used by students to learn and practice solving practice questions independently without being controlled by subject teachers. Posttest test results in the experimental class showed the Minimum completeness Criteria which reached 93.75%, so it was concluded that the smartphone-based learning application is very feasible to use as an effective learning media.

This paper proposes a learning media model that utilizes mobile technology (smartphone) to help teachers deliver subject matter outside of formal learning time, as a form of enriching subject matter that is not completely delivered in the classroom due to time constraints. Subject material in the form of teaching materials and practice questions delivered to students, distributed in a controlled manner (gradually) through a global communication network to the smartphone device of students in accordance with the stages of learning contained in the learning design. Thus, the learning strategy offered in this mobile-based learning media technology is independent learning that is controlled by the teacher.

2 Research Method

This study uses the Research and Development Method (R&D), adapting the stages of Research and Development proposed by [12]. The steps of the study consist of First, Analysis of system requirements involving learning designers, institutional management, and college graduates or the business world as graduate users [12]. They are included in the formulation of competencies in the field of software modeling needed in learning design. Second: Development of learning design, following the procedure for developing learning designs proposed by [13]. The development stage consists of two main steps, namely identifying learning needs and developing learning designs. The advanced PBL concept is implemented at the scene of preparing the learning strategy. Third: Formative Evaluation to test the effectiveness of the model.

Formative Evaluation, consisting of (1) product expert validation (learning aspects and aspects of learning material), and (2) Product of Mobile Technology Application trials (Individual learners and small groups). At the end of each trial phase, data analysis and product revisions are carried out based on the input obtained from the experiment.

3 The Proposed Model Concepts

Learning strategies carry the concept of mixed learning (blended learning). At the beginning of the process, students and teachers conduct face-to-face learning in class according to the schedule set by academic management in the school. Teaching materials that are not finished are delivered in class, distributed to students through learning media based on mobile technology systems. Students study learning material and practice working on practice questions through a smartphone device at certain times, under the control of the subject teacher outside formal study hours. The architecture of learning media based on mobile technology systems is presented in Figure 1.

Fig.1. Architecture of Learning Media Based on Mobile Technology Systems

In Figure 1, a computer server containing a database of subject matter and practice questions sourced from the subject teacher is placed in the school. The server is managed by a System Administrator. Study materials and practice questions are regularly distributed to students' smartphones via the internet. The distribution of teaching materials and practice questions is controlled by the subject teacher through the smartphone terminal, in accordance with the learning design that has been prepared.

The application interface of a mobile technology-based application is divided into three main modules, namely: the interface module on the system administrator side (figure 2), the interface module for subject teachers (picture 3), and the interface module for students (picture 4).

The operation of the system is divided into 3 main stages, namely the stage of user registration by and classes conducted by the System Administrator, the stages of learning preparation conducted by the teacher, and the stages of learning conducted by students. In the initial stages (user and class registration), the system administrator registers all study participants and instructors into the system to get an authentication account (figure 2). At the beginning of each semester, the system administrator also makes class plans, by registering and giving a unique identity to each subject and sub-subjects to be taught in all classes,

including assigning study participants and instructors to each class that is formed, so that each eye class lessons and subtopics at each grade level have a unique identity.

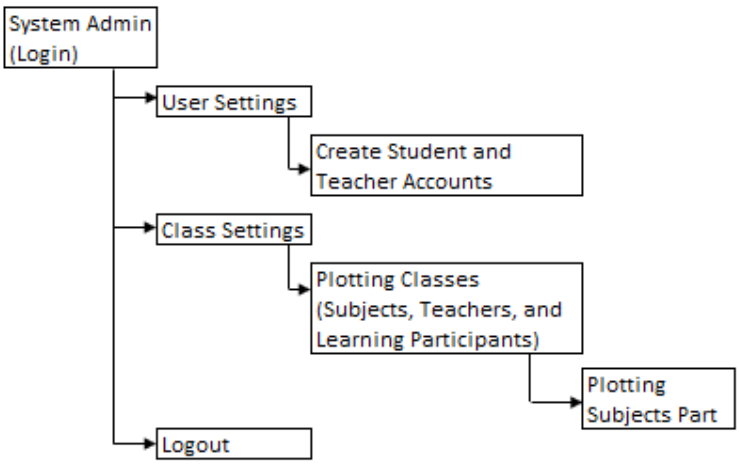

Fig.2. Site Map Interface on the System Administrator Side

In the second stage (the preparation phase of learning), the subject teacher uploads the main teaching materials and enrichment teaching materials in the form of text files or multimedia-based tutorial files, as well as practice questions for each class that is formed (figure 3). Furthermore, subject teachers periodically distribute teaching materials along with practice questions through a global communication network to students in accordance with the planned learning schedule. The distribution of teaching materials and practice questions can be done simultaneously to all participants studying in a particular class, or for some reason only addressed to certain students who are wanted. With concepts like this, the teacher still holds a central role in controlling the learning process. In this module the teacher can also see the results of learning feedback (student test results) for each sub subject that students have studied, both overall student test results and for certain students, to be a reference for teachers in evaluating the learning system that is held.

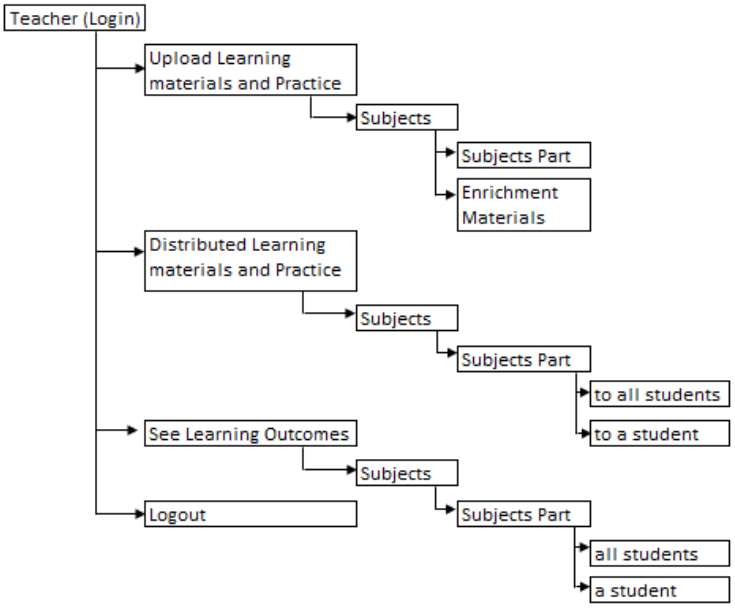

Fig.3. Site Map Interface on the Teacher's Side

The third stage is the core stages of a learning system based on mobile technology, namely the stages of independent learning carried out by students through a smartphone device. Each teaching material and practice questions distributed by subject teachers in a particular class will be known by students through the "New Learning" menu interface (figure 4). Students access new learning files, study them independently, and practice answering practice questions at the end of each learning session. Students can see the interim results obtained in the practice process (answering practice questions), and are given the opportunity several times to restart studying certain sub topics (remedial) if the test scores have not yet reached the mastery standards set by the subject teacher, through the interface "Learning and Remedial History" menu. Students also have the opportunity to learn enrichment teaching materials to further deepen mastery of the material in certain sub-subjects before following the remedial process.

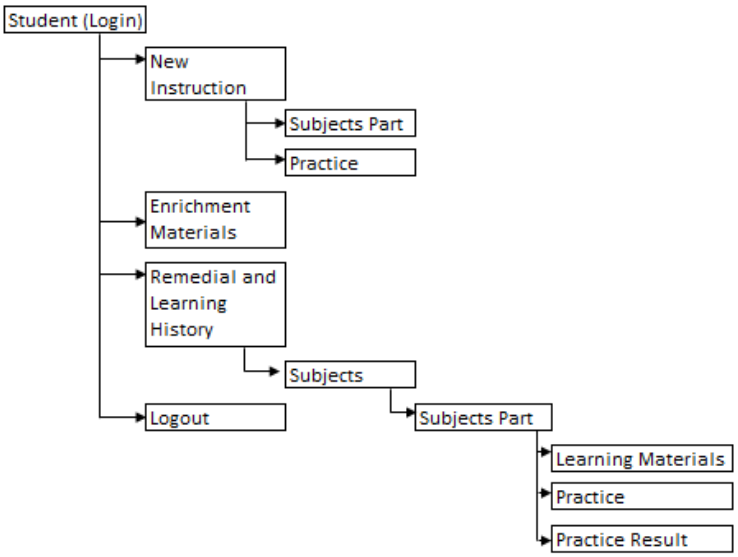

Fig.4. Site Map Interface on Student Side

This research was carried out from January to October 2019, with a total of 100 samples. We divided the data into two groups consisting of 'no CP' (50 data without CP) and 'with CP'(50 data with CP intervention).

4 Results and Discussion

After the draft instructional media product has been developed, the next step is the assessment process by experts (media experts and learning design experts). Inputs provided by experts are used as references to make improvements to learning media product.

The expert assessment was carried out using a questionnaire adapted from 'Evaluation and Selection of Learning Resources: A Guide 2008'. The assessment range was 1-4 with an interpretation of 4 = appropriate, 3 = sufficiently appropriate, 2 = inaccurate, and 1 = inappropriate. Each value given is transformed into a percentage with a description of the value 85 - 100 = very feasible does not need to be revised, 75 - 84 = feasible does not need to be revised, 55 - 74 = inadequate need to be revised, and 0 - 54 = not feasible need revision. In the questionnaire, expert can provide suggestions, criticisms, and input on the learning media product developed. The following is presented results of expert evaluations of the instructional media product developed Table 1.

Table 1. Results of Expert Validation

Expert	Score
Media Expert	82.1%
Instructional Design Expert	83.5%
Average	82.8%

Based on the table 1, it can be explained as follows:

1. The results of the media expert's assessment obtained a value of 82.1%, indicating that the instructional media product developed were in the category of proper use.
2. The assessment of Instructional design experts on instructional media product obtained a value of 83.5%, in the category worthy of use.
3. Overall the average value of the instructional media product validation developed is 82, 8%. This value is in the category worthy of use.

Results of the validation in table 1, showing that instructional media product based on mobile technology are very suitable to be used as instructional resources. The instructional media product validation percentage result has not reached 100% because there are still shortcomings of the product, such as the lack of images, animation and videos that support the material. The following is expert advice as a reference for improving the instructional media product. After validation and revision based on expert input, the instructional media product was tested on students. The trial process consists of two stages: Individual learners and small groups. Individual trials were conducted involving 3 students and a large group trial involved 9 students. The students were selected randomly, where there were students who had high learning outcomes, students who had moderate learning outcomes, and students who had low learning outcomes. After being believed to be heterogeneous, students were asked to provide responses, suggestions and input by filling out the feasibility questionnaire given previously. The last results of student responses (large group trial) to the instructional media product after obtaining suggestions and input at the individual learner trial can be seen in table 2.

Table 2. Results of Student Responses

Aspect	Results
Attractive Display	80.7%
User Friendly	80.1%
Material Presentation	82.9
Average	81.2%

There are two aspects of assessment conducted by students on instructional media products, namely non-functional aspects (attractive display and user friendly) and functional aspects (material presentation). In the non-functional aspect (physical appearance), students assess that the instructional media product developed has an attractive appearance (the assessment results reach 80.7%) and easy to use (the assessment results reach 80.1%). In the functional aspects instructional media products based on mobile technology developed can present teaching materials effectively (can be used by students to learn anytime and anywhere, and can present learning materials that are easily understood by students), with an assessment result reaching 82.9%. These results are in line with the findings of [9] who suggested that practical and effective mobile technology-based learning applications are used in learning, and the findings of [14] which recommends the use of smartphone applications as an effective learning aid, and can be used as a complement to traditional learning. The findings in this study are also in line with the findings of [15] who developed an Android smartphone-based learning media, and found that learning media based on mobile technology was appropriate to be used as a learning resource for students.

5 Conclusions

The results of student responses at the large group trial shows that the instructional media product based on mobile technology is very feasible to use as an instructional resource to enriching teaching material for Primary School Student post-learning in the classrooms. The result obtained an average value of 81.2%.

The limitation of this research is that in the product evaluation process there has not been a study involving teacher perceptions as an inseparable part in the mobile technology-based learning system in elementary schools.

6 Acknowledgments

Thank you to the **Director of Research and Community Service - Indonesian Ministry of Research, Technology and Higher Education** for funding this research, in the 2019 Competitive Research Grant (Basic Research) scheme.

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Dokumen pendukung luaran Wajib #3

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2 Research Method

This study uses the Research and Development Method (R&D), adapting the stages of Research and Development proposed by [12]. The steps of the study consist of First, Analysis of system requirements involving learning designers, institutional management, and college graduates or the business world as graduate users [12]. They are included in the formulation of competencies in the field of software modeling needed in learning design. Second: Development of learning design, following the procedure for developing learning designs proposed by [13]. The development stage consists of two main steps, namely identifying learning needs and developing learning designs. The advanced PBL concept is implemented at the scene of preparing the learning strategy. Third: Formative Evaluation to test the effectiveness of the model.

Formative Evaluation, consisting of (1) product expert validation (learning aspects and aspects of learning material), and (2) Product of Mobile Technology Application trials (Individual learners and small groups). At the end of each trial phase, data analysis and product revisions are carried out based on the input obtained from the experiment.

3 The Proposed Model Concepts

Learning strategies carry the concept of mixed learning (blended learning). At the beginning of the process, students and teachers conduct face-to-face learning in class according to the schedule set by academic management in the school. Teaching materials that are not finished are delivered in class, distributed to students through learning media based on mobile technology systems. Students study learning material and practice working on practice questions through a smartphone device at certain times, under the control of the subject teacher outside formal study hours. The architecture of learning media based on mobile technology systems is presented in Figure 1.

Fig.1. Architecture of Learning Media Based on Mobile Technology Systems

In Figure 1, a computer server containing a database of subject matter and practice questions sourced from the subject teacher is placed in the school. The server is managed by a System Administrator. Study materials and practice questions are regularly distributed to students' smartphones via the internet. The distribution of teaching materials and practice questions is controlled by the subject teacher through the smartphone terminal, in accordance with the learning design that has been prepared.

The application interface of a mobile technology-based application is divided into three main modules, namely: the interface module on the system administrator side (figure 2), the interface module for subject teachers (picture 3), and the interface module for students (picture 4).

The operation of the system is divided into 3 main stages, namely the stage of user registration by and classes conducted by the System Administrator, the stages of learning preparation conducted by the teacher, and the stages of learning conducted by students. In the initial stages (user and class registration), the system administrator registers all study participants and instructors into the system to get an authentication account (figure 2). At the beginning of each semester, the system administrator also makes class plans, by registering and giving a unique identity to each subject and sub-subjects to be taught in all classes,

including assigning study participants and instructors to each class that is formed, so that each eye class lessons and subtopics at each grade level have a unique identity.

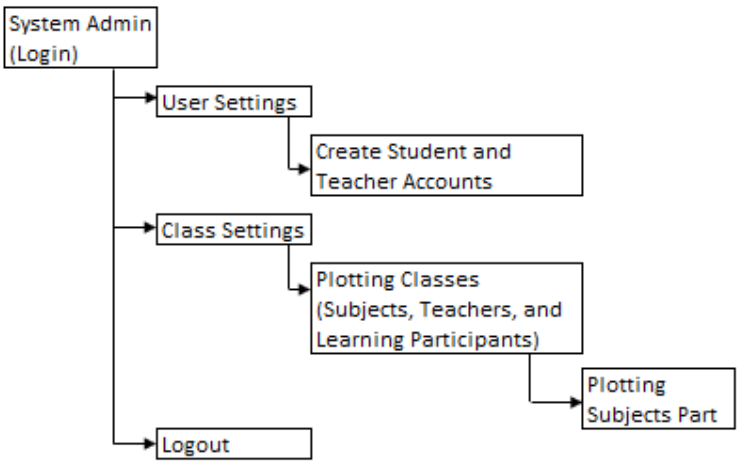

Fig.2. Site Map Interface on the System Administrator Side

In the second stage (the preparation phase of learning), the subject teacher uploads the main teaching materials and enrichment teaching materials in the form of text files or multimedia-based tutorial files, as well as practice questions for each class that is formed (figure 3). Furthermore, subject teachers periodically distribute teaching materials along with practice questions through a global communication network to students in accordance with the planned learning schedule. The distribution of teaching materials and practice questions can be done simultaneously to all participants studying in a particular class, or for some reason only addressed to certain students who are wanted. With concepts like this, the teacher still holds a central role in controlling the learning process. In this module the teacher can also see the results of learning feedback (student test results) for each sub subject that students have studied, both overall student test results and for certain students, to be a reference for teachers in evaluating the learning system that is held.

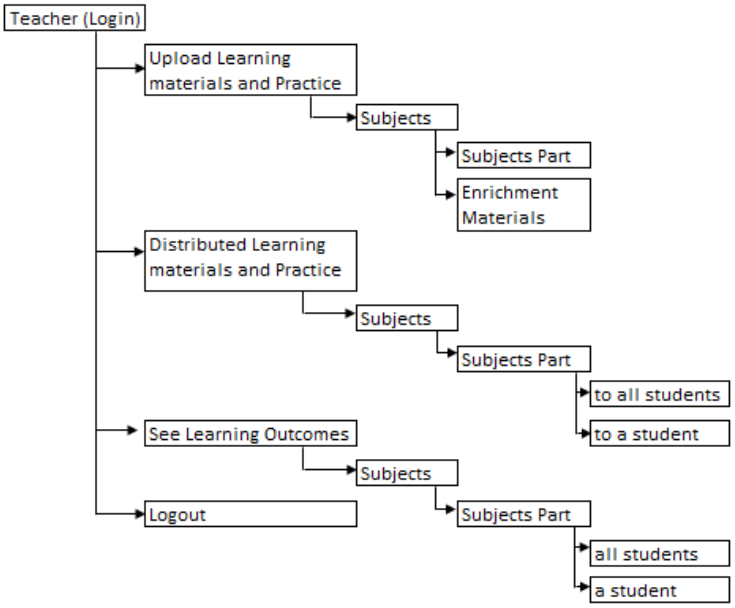

Fig.3. Site Map Interface on the Teacher's Side

The third stage is the core stages of a learning system based on mobile technology, namely the stages of independent learning carried out by students through a smartphone device. Each teaching material and practice questions distributed by subject teachers in a particular class will be known by students through the "New Learning" menu interface (figure 4). Students access new learning files, study them independently, and practice answering practice questions at the end of each learning session. Students can see the interim results obtained in the practice process (answering practice questions), and are given the opportunity several times to restart studying certain sub topics (remedial) if the test scores have not yet reached the mastery standards set by the subject teacher, through the interface "Learning and Remedial History" menu. Students also have the opportunity to learn enrichment teaching materials to further deepen mastery of the material in certain sub-subjects before following the remedial process.

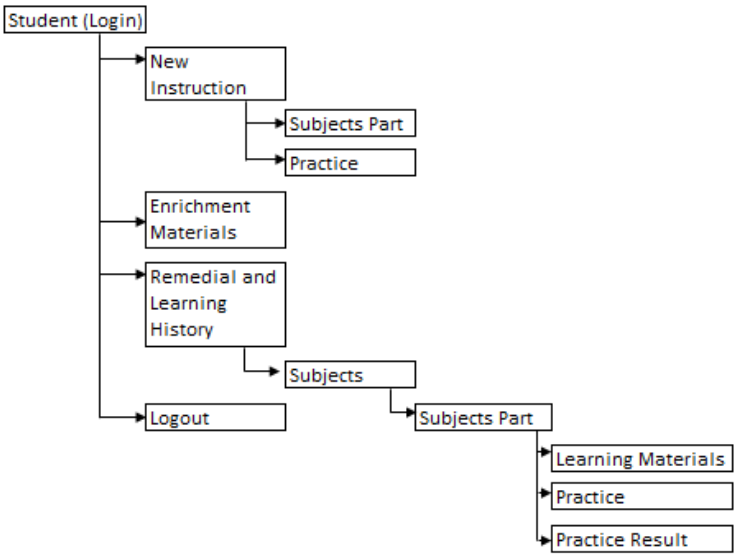

Fig.4. Site Map Interface on Student Side

This research was carried out from January to October 2019, with a total of 100 samples. We divided the data into two groups consisting of 'no CP' (50 data without CP) and 'with CP'(50 data with CP intervention).

4 Results and Discussion

After the draft instructional media product has been developed, the next step is the assessment process by experts (media experts and learning design experts). Inputs provided by experts are used as references to make improvements to learning media product.

The expert assessment was carried out using a questionnaire adapted from 'Evaluation and Selection of Learning Resources: A Guide 2008'. The assessment range was 1-4 with an interpretation of 4 = appropriate, 3 = sufficiently appropriate, 2 = inaccurate, and 1 = inappropriate. Each value given is transformed into a percentage with a description of the value 85 - 100 = very feasible does not need to be revised, 75 - 84 = feasible does not need to be revised, 55 - 74 = inadequate need to be revised, and 0 - 54 = not feasible need revision. In the questionnaire, expert can provide suggestions, criticisms, and input on the learning media product developed. The following is presented results of expert evaluations of the instructional media product developed Table 1.

Table 1. Results of Expert Validation

Expert	Score
Media Expert	82.1%
Instructional Design Expert	83.5%
Average	82.8%

Based on the table 1, it can be explained as follows:

1. The results of the media expert's assessment obtained a value of 82.1%, indicating that the instructional media product developed were in the category of proper use.
2. The assessment of Instructional design experts on instructional media product obtained a value of 83.5%, in the category worthy of use.
3. Overall the average value of the instructional media product validation developed is 82, 8%. This value is in the category worthy of use.

Results of the validation in table 1, showing that instructional media product based on mobile technology are very suitable to be used as instructional resources. The instructional media product validation percentage result has not reached 100% because there are still shortcomings of the product, such as the lack of images, animation and videos that support the material. The following is expert advice as a reference for improving the instructional media product. After validation and revision based on expert input, the instructional media product was tested on students. The trial process consists of two stages: Individual learners and small groups. Individual trials were conducted involving 3 students and a large group trial involved 9 students. The students were selected randomly, where there were students who had high learning outcomes, students who had moderate learning outcomes, and students who had low learning outcomes. After being believed to be heterogeneous, students were asked to provide responses, suggestions and input by filling out the feasibility questionnaire given previously. The last results of student responses (large group trial) to the instructional media product after obtaining suggestions and input at the individual learner trial can be seen in table 2.

Table 2. Results of Student Responses

Aspect	Results
Attractive Display	80.7%
User Friendly	80.1%
Material Presentation	82.9
Average	81.2%

There are two aspects of assessment conducted by students on instructional media products, namely non-functional aspects (attractive display and user friendly) and functional aspects (material presentation). In the non-functional aspect (physical appearance), students assess that the instructional media product developed has an attractive appearance (the assessment results reach 80.7%) and easy to use (the assessment results reach 80.1%). In the functional aspects instructional media products based on mobile technology developed can present teaching materials effectively (can be used by students to learn anytime and anywhere, and can present learning materials that are easily understood by students), with an assessment result reaching 82.9%. These results are in line with the findings of [9] who suggested that practical and effective mobile technology-based learning applications are used in learning, and the findings of [14] which recommends the use of smartphone applications as an effective learning aid, and can be used as a complement to traditional learning. The findings in this study are also in line with the findings of [15] who developed an Android smartphone-based learning media, and found that learning media based on mobile technology was appropriate to be used as a learning resource for students.

5 Conclusions

The results of student responses at the large group trial shows that the instructional media product based on mobile technology is very feasible to use as an instructional resource to enriching teaching material for Primary School Student post-learning in the classrooms. The result obtained an average value of 81.2%.

The limitation of this research is that in the product evaluation process there has not been a study involving teacher perceptions as an inseparable part in the mobile technology-based learning system in elementary schools.

6 Acknowledgments

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Dokumen pendukung luaran Tambahan #1

Luaran dijanjikan: Buku Ajar (ISBN)

Target: sudah terbit
Dicapai: Review

Dokumen wajib diunggah:
1. Bukti sedang dalam proses review
2. Naskah buku ajar meliputi lembar yg memuat nama penulis dan daftar isi

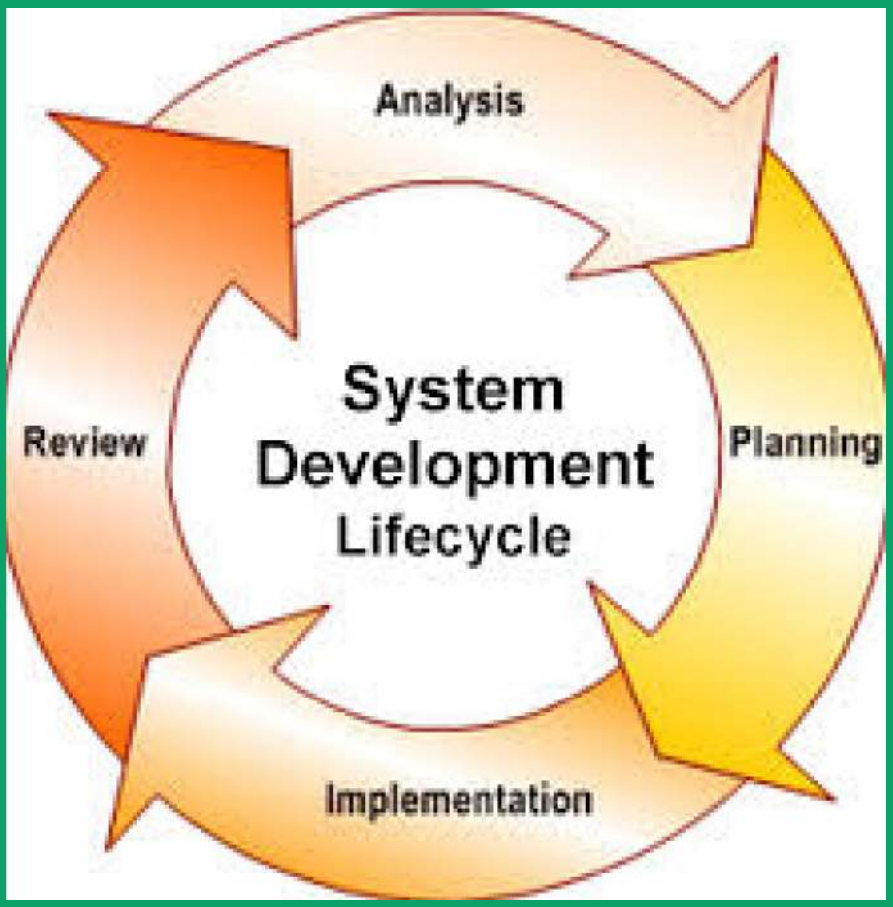
Dokumen sudah diunggah:
1. Naskah buku ajar meliputi lembar yg memuat nama penulis dan daftar isi
2. Bukti sedang dalam proses review

Dokumen belum diunggah:
-

Judul Buku: Analisis Dan Pemodelan Sistem Informasi - Pendekatan Terstruktur & Berorientasi Objek
Nama Penerbit: Penerbit Puslitbang & P2M STMIK Banjarbaru
Website Penerbit: -
ISBN:
Tahun Terbit:
Jumlah Halaman:
URL Buku:

Analisis Dan Pemodelan Sistem Informasi

Pendekatan Terstruktur & Berorientasi Objek



Bahar Soegiarto

Daftar Isi

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Pusat Penelitian, Pengembangan dan Pengabdian Pada Masyarakat STMIK BANJARBARU
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SURAT KETERANGAN
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Judul Buku Ajar	:	ANALISIS DAN PEMODELAN SISTEM INFORMASI – Pendekatan Terstruktur dan Berorientasi Objek
Penulis	:	Bahar Soegiarto
Jumlah Halaman Isi	:	+- 422

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STMIK Banjarbaru

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