Conceptual Model Design of Assistances System Development for Informatics Proficiency TestBased on Ubiquitous Learning

RanggaFirdaus, BasukiWibawa, Khaerudin

[a]DepartmentofComputerScience, FacultyofMathematicsandNaturalScience,UniversityofLampung

[b,c]EducationalTechnologyStudyProgram,Education Faculty,JakartaStateUniversity
[a]rangga.firdaus@gmail.com, [b]bwibawa@unj.ac.id, [c]khaerudin_tp@yahoo.com

Article History: Received: 10 December 2020; Revised 12 February 2021 Accepted: 27 February 2021; Published online: 5 May 2021

Abstract : Thedevelopment ofInformation and Communication Technologyiscurrentlyinfluencing graduates'competencies ineveryIndonesiaUniversity. Someofthephenomena obtainedinthefieldboth technicallyandnon-technicalinclude:Therearestillfew andtendtohavenoinformationfromthecampusrelated tothecompetenceoflecturersandstudentsinthefieldof informatics. Minimalinformation onthecollaboration between thecampus worldandindustrial fields published inthemedia.Cooperation betweencampus withprofessional associations andindustryassociations inimplementing thelinkandmatch,especiallyin curriculum development,feelargeenoughinfollowing thecertificationtestprofessionalsininformatics,yetseen asystemthatactsasanaggregator,asystemthatbridges between industry andthefieldofcampus. The characteristicsmodeldevelopedinthisresearchbroadly combines threemodelsofinterrelated system development betweentheBorgandGallmodelasthe backbone, Hanafin, andPack asthelearninginteraction process,andthewaterfall modelasthemakingofthe mentoringapplication system.Thefinalresultofthe researchistheestablishmentofconceptualmodeldesign in adigitallearningsystemfromacertificationprogram based onthe IndustrialProfessionaland Association fields.

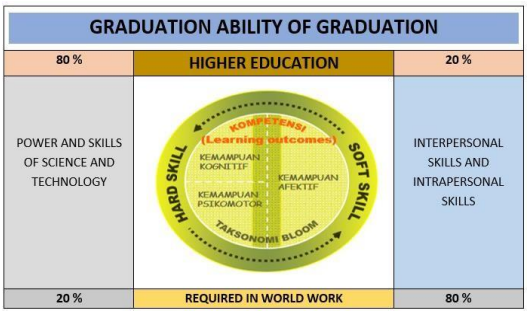
Keywords: Conceptual ModelDesign,Information Technology,ResearchandDevelopment, Mentoring System,UbiquitousLearning

1. Introduction

TheuseofICTinvariousfieldsofhumanlife has beenimpactingtheincreasingneedfor ICTgraduates.Trendsthatfastlycontinuetogrowin thefield ofInformationTechnology require humanresourcesthatare masterandqualifiedin technology.Collegeofbothstateandprivaterace-theracetobeabletoconvey scientific informationon the fieldofInformationand Communication Technology, with strengths and localknowledge of thecampus- the campusof Informatics. According toGregor[1], United Nationsdividesinformatics HumanResources (HR) into two types,namely:IT Workers and- Enabled Workers.ITWorkers (ITW)are those whohavespecializedcompetenciesandexpertiseto givebirthto creativeworksofinnovationinthe fieldof informatics,suchasPrograms, applications, algorithms, hardware, methodologies, implementationapproaches,and others.While IT-Enabled Workers (IEW)are those,whohavetheskillsto useorutilize (utilization)informationtechnology tohelpand supporttheir daily activities.ITWisahuman resourceproduced by aUniversity ofinformatics, so everyrelated higher education institutionneeds toknowindetailthecharacteristicsofthetypesofITWneeded bythe outsideworld.

Basedonitscharacteristics[2],atleastinformatics college graduateswill actasEmployeeswill pursue theircareersfromstaff levelstohigher levels,bothinthecompany andother organizationalforms; Entrepreneurs (entrepreneurs),willusetheability ofcreativity andinnovationthatthey havetobuildan independentbusinessorcreate jobsfor others usuallystartswithbuilding smallandmedium businessesSMEs; Professionalswillbecome freelancerswhoareready toberecruitedanytime by anyoneintheformatofprojectorprogram based work; Bureaucrats will work as civil servantsorgovernment employeesbasedon roles andfunctionsdefinedby thestate;orAcademics will focus on becoming instructors, lecturers,or researchersinvarioushighereducationinstitutions thatgivebirthtonewscholars.The hugeproblem isthatcurrently thereareagrowingnumberof learning curriculaonthecampusofvarious informaticsfields.Atthesametime,many world complaintsofworks,thatthecompetence of graduates,especially inthefieldofinformaticsis inadequate,andnotrelevanttothe needsof the workforce.Many graduatesarenotready touse, notreadytowork,asdesiredbytheworldofwork. Itisbecausethecontents ofthelearningoutcomes of thecurriculummade are notsynchronous between theworldofeducation and the industrial

world.Besides,withtheapproaching ASEAN EconomicCommunity (MEA)only afewyears away.Covering 3%ofthetotallandareaofthe Earth, this 4.46 million km 2 island with a populationof around600millionpeople,withan estimated combined gross domestic product (GDP)of$2.1trillion;Thereisagapintheability ofgraduatesintertiary institutionsinIndonesiato thoseneeded by theindustrialworldortheworld of work as inFigure1.2below:



(Source: DiktiBelmawa,2012)

Figure1.2 Gaps Abilityof Graduates

Some of the thingsobtained inthe fieldboth technicallyandnon-technicallyinclude:(1)There are stillfewandtendtohavenoinformationfrom thecampusstating thatgraduatesfromeach informaticsfieldstudy programhavevalueorare competentintheirrespective fields,bothfromthe sideoflecturersandstudents.(2) Minimal information on cooperation between theworld of campusandthe publishedindustrialfieldsinthe media,iftherearestillwithin thescopeof accreditation formsand internalcampusonly. (3) There isstillnotmuchcollaborationbetween professionalassociationsandindustryassociations inimplementinglinkandmatch,especially in curriculumdevelopment.(4)Thecostisquitehigh inparticipatingintheprofessionalcertificationtest inthefieldof informaticsforparticipantsboth studentsandlecturersranging fromtwomillion rupiahstotensofmillionsofrupiahsforeachtest intheinformaticsfieldcertificationprofession.(5) There hasnotbeen seenasasystemthatactsasan aggregator,namely asystemthatbridgesbetween industrialfieldsandcampusfields,especially in thefield ofCertificationTestinthe fieldof Informatics.(6)Thereisstill minimal test informationontechnicalknowledge providedby industry associationsorprofessionalassociations inthe fieldofinformaticsgiven tostudentsand lecturersoneachcampus.(7) The absenceofdata thatbringstogether allcertificationtest participantsorindustry knowledgetests (Proficiency)boththosewhohave followedand havesuccessfully passedtheproficiency test.The useofU-Learning canoccurtomotivatestudents tobemorecreativeandmoreinspiring sothatthe materialand content learned can increase their Skill ability (Expertise),Knowledge(Knowledge),and Attitude (Attitude) Also,U-Learning isone of the learningmethodsthatarecurrently developing. Thesedevicescanuseinthelearningenvironment forproviding activeandadaptivesupportto students in real-world learningandtraining[3].

Three maincomponentstoconsiderinthe developmentoflearning models,namely:a) learning conditions;b)learning methods,andc) learningoutcomes [4],[5]. Learningconditionsinclude learningcharacteristicsintheform of goalsandbarriers tolearningandstudent characteristics.Learningmethodsincludehow to organizelearning materials,strategiesfor deliveringandmanagingactivities.Whilelearning outcomesinclude effectiveness,efficiency,and attractivenessoflearning forstudents[6],[7].There areseveralmodels, including 1)conceptual models,2) proceduralmodels,and3) physical models. Theconceptual model isthe conceptualizationoftheory orinotherwords,the realizationof atheory.The proceduralmodelhas prescriptive propertiesabouthow thingsare. Proceduralmodelsaremanifestationsofthestages ofmodelformation.Whilethephysicalmodelofa model isinphysicalform(product) [8],[9], in designingalearning system,themodelusually describesthestepsorprocedures thatmustbecarried out tocreateeffective,efficient,and excitinglearningactivities.

TheMentoringSystemismorelikely toachieve successwhereinstitutionalculture hasmoved towardsappreciationof educationalrightsandis inclusiveofstudents,andfarfrompastwithdrawal modelsforassistanceinrepairs.Learning support which isan integralpart of the programbut specificinhandlingidentified needs, will bemore likely tobetakenandvaluedby students[10].The Mentoring Systemcanincludeany activity, outsidethespecified'content' ofthecollege program,whichwillcontribute

totheattendance, retention,learning,andachievementof individual students.Insomecases,thiswillbeanintegralpart of theprogram;in another other addition.

Table 2.1. Recommendations forpractical supportforlearning

Student Needs	Role of Provider	Standars for Universitas	Intructions
Help identify the strengths and weaknesses of the learners themselves and develop action plan	Ensure learning support needs of student s from under represented groups	The need for learning support of students from underrepresented groupswasassessed systematically in all programs	Summary of support needsof students fromnderrepresented groups
Oportunities to improve weaknessthrough additional tuition or practice fees	Effectively support students withlearning difficultiesand / or disabilitiesin mainstream andseparate specialistprograms	There are strategies to meet the learning support needsof these students	Policies and strategies forlearning support acrosscolleges and evaluation oflearning support andtutorial programs
Acess to personal support	Create a tutorialsystem that meetsthe needs of allstudentsGive access toprofessionalcounseling	The effectiveness of learningsupport for studentsfromunderrepresented groups is evaluated including the use of the views of students	Plans for individual support for students Individual student actionplans, tutorial policies andframeworks
Individual meetings with tutors to review progress	Monitor theeffectiveness oflearning support	All students are satisfied with the quality of support they receive	Recording summary ofcounseling services

Source: green, M and L. Melbourne(1998)

The Mentoring Systemis trainedand instructed to circulate theclassduring think-pair-shareactivitiesor groups to engage in discussionswith groupsof students. They are assignedto bring upstudent reasoningduringtheconversationbecausethispractice hasproven tobe themosteffective ingenerating studentreasoning[11].

UbiquitousLearningwillhelpintheorganizationand mediationofsocialinteractionswhereverand wheneverthissituationmightoccur[12].Theincrease inwirelesst elecommunicationscapabilitieshas acceleratedthisrecentevolution, opennetworks, increasedcontinuouscomputingpower, improved battery technology,andtheemergenceofflexible software architectures. Withthese technologies, individuallearningenvironmentscanembedinreallife everyday.UbiquitousLearningfocusesonthelearning missionitself.Inthecontextof learning everywhere, Learning isanaturalandspontaneousactivity. Conversely, in aubiquitous learning environment, technology isperipheral,evenbeyondtheattention of students. Theservice functions ofthe technology are improved, but the visibilitystill week.

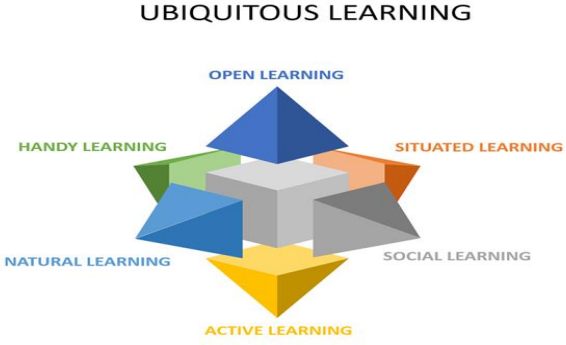


Figure 2.1. Ubiquitous LearningSystem

U-learning-basedmediathatis usedinthisstudyisaweb-supportactivity suchasaseminarorpublic lectureon distanceeducation.The activitycanalsobecarriedout by ahighereducation/service/localagency whichis attendedbystudentsorcommunitieswhoaretargetsof enlightenment.Asshown by Bloomberg [13],who concluded thatlearning communitiesarecatalystsor motivatorsforlearning,andsupportgroupstomaintain andmaintainthelearningprocess. Throughthevideo conferencemediainBloomberg'sresearch,interactions thatoccurinthecontextofsocialculturecan improve thelearningprocessbetween students. U-learninguses mobiledevices that offera unique andpersonal platform todevelopalearner-centerededucational experience throughpersonalized information and services.Learners in theu-learningenvironmentcan learnfromthematerialprovidedbyu-learningsystems basedon their learning preferences[14]. Besides,the characteristic ofcombining authenticsituations enhances the development of location-based services where students can access relevantand contextual informationbasedon theirdifferenttasksandneeds. The connectionbetweencontextualization and personalizationof learning is basedon theconceptof learner-centered learning,emphasizing personalneeds andgoals,differences in knowledgeand interests,and environmental factors[15].

Themaincharacteristicsofu-learninginclude mobility,interoperability,fluency, location awareness, socialawareness,adaptability,andattractiveness,[16] andthisnewlearningparadigmistoofferavarietyof learningactivitiesforstudents. Togaina deeper understandingofthenatureoflearning-includingthe characteristicsoftheu-learningenvironmentandits effectonstudentperformance,thisstudyfirstreviews theperspectivesidentifiedtohaveaclearpictureofu- learningregardinglearningeffectivenesswitha particularfocusonelementsfollowingelements: personalizedlearningenvironment, strategy-driven learningdesign, studentmemory, learning achievement, and learningmotivation. U-learninguses mobiledevicesthatoffera uniqueandpersonal platformtodevelop a learner-centereducational experiencethroughpersonalizedinformationand services[17].Learnersintheu-learningenvironment canlearnfromthematerialprovidedbyu-learning systemsbasedontheirlearningpreferences [18]. Besides, thecharacteristicofcombiningauthentic situationsenhancesthedevelopmentoflocation-based serviceswherestudentscanaccessrelevantand contextualinformationbasedontheirdifferenttasks andneeds.Theconnectionbetweencontextualization andpersonalizationlearning,basedontheconceptof learner-centeredlearning,emphasizingpersonalneeds andgoals,differencesinknowledgeandinterests,and environmental factors[19].

3. Research Method

3.1 Research ApproachesandMethods

ThisresearchusesaResearchandDevelopment(R&D)approachforconductingresearch.Researchand developmentmethodsareresearchmethodsusedto producespecificproductsandtesttheeffectivenessof theseproducts[20].Researchanddevelopmentisa processorstepstodevelopnewproductsorimprove existing products.Inthefieldofeducation, products produced throughR&D,areexpected toincrease the productivity ofeducation, suchasgraduateswhoare numerous,qualified, and relevant to theirneeds. Educationalproductssuch asspecificcurricula for particulareducationalneedswerealso teaching methods,learning media, textbooks,modules, evaluation systems,competency testmodels,and others.Productisfield testsandreviseduntila perspective levelof effectiveness is achieved. Borg andGalidefine developmentresearch are:is a processused todevelop andvalidateeducational products.Thestepsofthisprocessare usuallyreferredto astheR&Dcycle,whichconsistsofstudying research findings pertinenttothe product tobedeveloped, developing theproductsbasedonthesefindings,field testingitin the settingwhere itwillbe used eventually [21].

3.2 Characteristics ofModels Developed

The targetofthetheresearch thatwas usedas the object of researchin thedevelopmentofthismodelwasallICT studentswhotook thetestofUbiquitousLearning-basedInformationField Certification. Thisstudy discusseshowtobuildamentoringsystemtocarryout theprocess ofcertificationtesting in the field of informatics forlecturersandstudentsusing internet mediaasan instructionalmediabasedonubiquitous learning.System developmentin thisstudydescribed as follows:

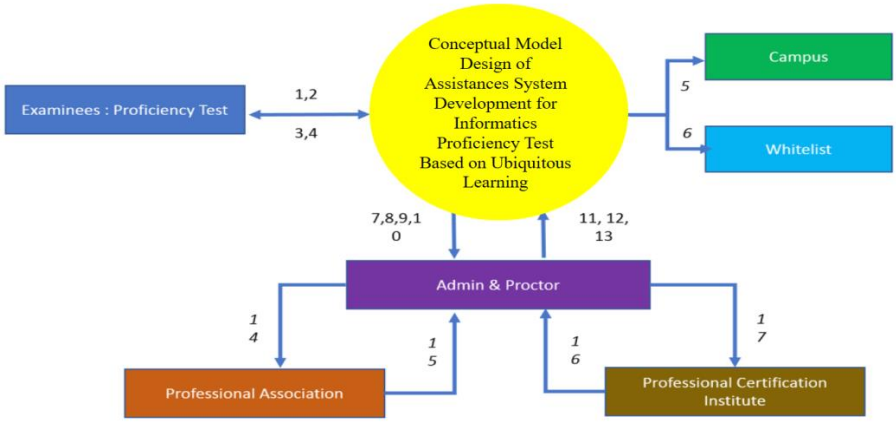


Figure 3.1 ContextDiagramofAssistanceSystemDevelopment

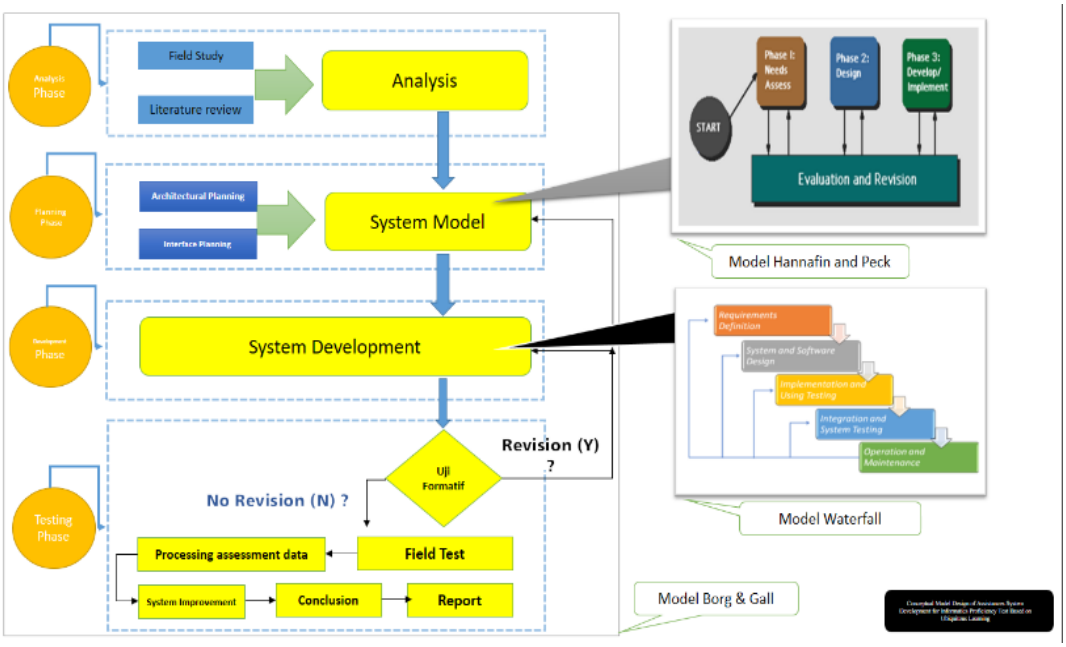
3.3 Software DevelopmentMethod

Webapplicationdevelopmenthasno structured standardsandmethodologies. Theapproachusedin generalisimplementation, testing,andrelease.The resultsof thesystem developmentareoften lowon reusability andvery difficulttomaintain.Wireless applicationdevelopmentrequirescoordination,namely the provision of processes, aspects of developing, testing,evaluating,distributing, andmaintaining wirelessapplicationsintegratedintothedesign process through the developmentlife cycle. Thedevelopment modelthatdevelopedusestheWaterfallprocessmodel. The waterfallmethod orwhat isoftencalled the waterfallmethod is often called the classic lifecycle, which illustratesa systematicandsequentialapproach tosoftwaredevelopment.Dstarting with the specifications ofuserneedsthencontinuesthrough the stagesofplanning (planning,modeling (modeling), construction(construction), aswellasthedelivery of thesystem to thecustomer(deployment),whichends with supportforthecomplete softwareproduced[22].

3.4 ModelDevelopmentStages

Indeveloping thesystem fortheconceptofthedesign modelthecombiningthreemodelsatonceprocedurallyuse.CommittheBorgandGallmodelasaplatformbyincluding HanafinandPeckmodelsasdesignmodels inBorg andGall,aswellasentering thewaterfall modelatthestageofmaking &developing the system inBorgandGall.TheexplanationexplaininFigure3.2

Figure 3.2ModelProceduralAssistanceSystem



3.5 Data Analysis

Intheprocessofdataanalysisin theconceptdesign modelofthesystem assistanceproficiency testing for informatics to obtaindata analysistechnique using severalthings, amongothers:

1. Analysis offield studyinstrumentdata
2. Data Analysis InstrumentValidation Expert
3. Analysis ofparticipantdata

Detailsasseein Figure 3.3

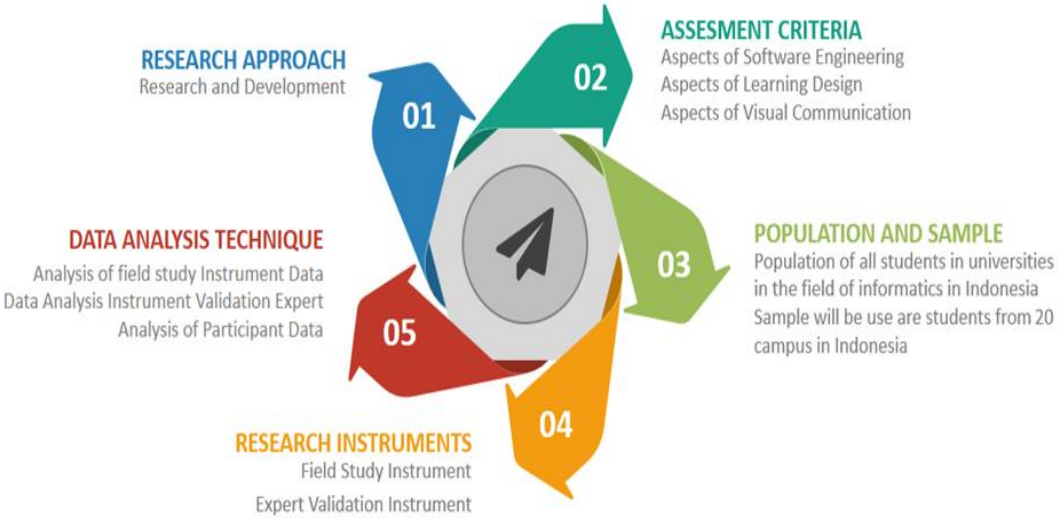


Figure 3.3 Data Analysis Process

4.Result

Theconceptofbuilding amentoring system in information proficiencytestingasseen in figure 4.1

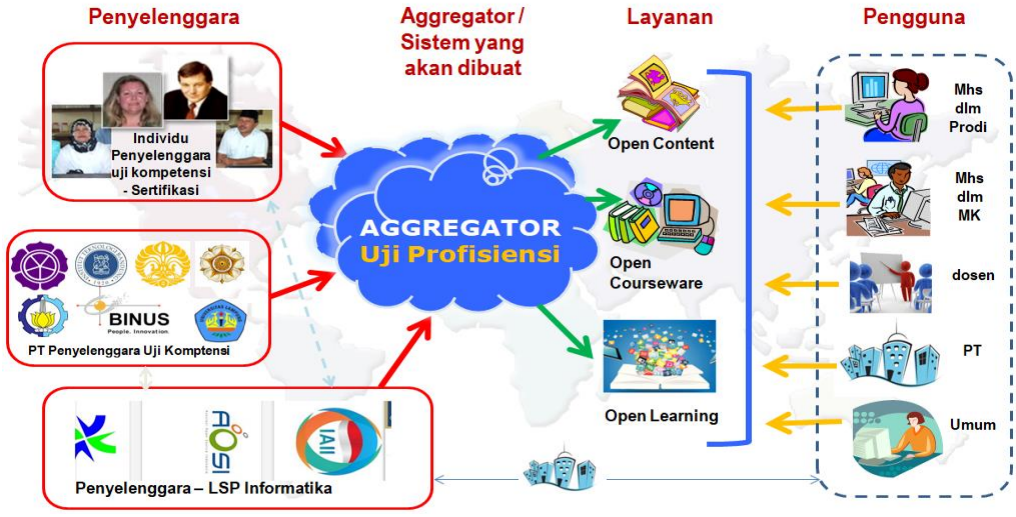


Figure 4.1 ConceptualModelDesign inthe DevelopmentofAssistanceSystems forProficiency TestforInformaticsCompetencyBased on Ubiquitous Learning

While the applicationoftheconceptdesignmodelof theproficiency testingassistancesystem canbemade withaweb-based applicationormobile, ascan beseen in Figure3.5

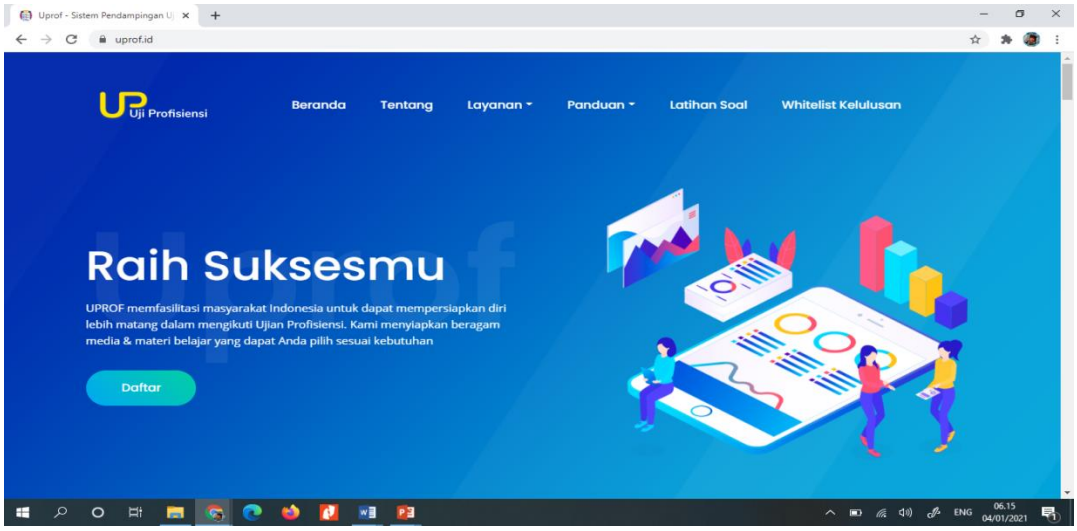


Figure 4.2 Implements ConceptualModelDesign in the DevelopmentofAssistanceSystems for Proficiency

Afterthestagesare carriedout,herearethefinalresultin applyingthedesignmodelconcept,asseeninFigure4.3.

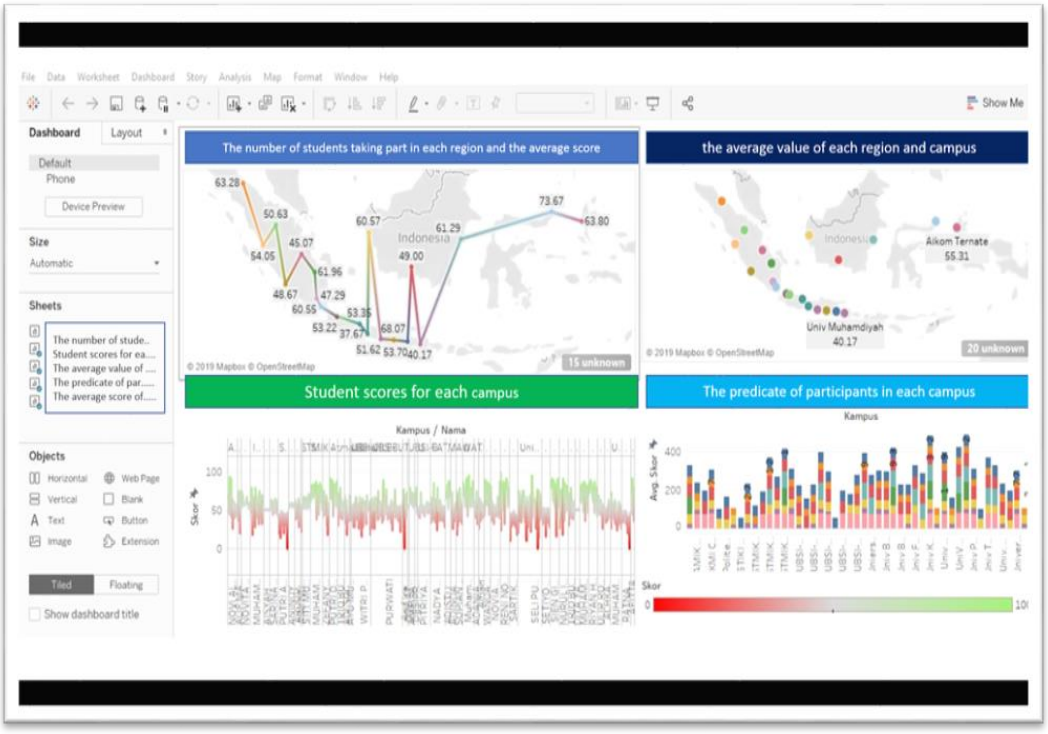


Figure 4.3 Theresultsofapplyingtheco nceptoftheProficiencyTestSystemDesign Model

5.Conclusion

Variouswaystoknitavariety ofteaching materials sourcestodeliverintheform oflearning innovation, Including howgivesmaterialunderthe Indonesian National Qualifications Framework (SKKNI)Standards inthe form ofOnlineLearning managedasasystem ofindependentlearningorasa companionsystemtotakethe informatics proficiency test.Innovativelearningassistancesystem modelsusing UbiquitousLearning havea future chancetoapply in the collaboration ofacademic learningsuchaseducation andbusinessthatmeetthe needsofindustryrequirementsandstudentinformatics qualified skills. Besides, businessprocesses thatcan manageinmoredetailandbroaderwillproduceagood businessprocessin fostering anentrepreneurialspirit.

Thisproceduralmodelisalsoarealstep,theformation ofasystem forthedisseminationofknowledgefor studentsin universitiesandbridging thescientific world ofeducation with thebusiness world.

References

[1] Gregor,S.etal.The ICTProfessionandthe ICT Body of Knowledge(Vers.5.0), Australian ComputerSociety,Sydney,Australia.2008.p.23
[2] Chanchan-mowetal. An EvaluationofRelevanceofComputingCurriculatoIndustryNeeds.Systemics,Cybernetics, andInformatics,13 (1), 7-12. 2015. P.7
[3] Chin, Kai-Yi. Chen, Yen-Lin. A Mobile LearningSupportSystem forUbiquitous LearningEnvironments. Selectionandpeer-reviewunder the responsibility of the 2nd International Conference onIntegrated Information.1877-0428©2013 TheAuthors. Publishedby ElsevierLtdDOI:10.1016/ j.sbspro.2013.02.013. p.16
[4] Kyndt,Eva,DavidGijbels,IlkeGrosemans,andVincentDonche."Teachers' everyday professionaldevelopment:Informalmappingoflearning activities, antecedents, and learningoutcomes."Review of educational research 86, no. 4 (2016):1111-1150.
[5] Nurbiha A Shukor, Zaleha Abdullah. "Using Learning Analytics to Improve MOOC Instructional Design" International Journal of Emerging Technologies in Learning (iJET), https://doi.org/10.3991/ijet.v14i24.12185
[6] CharlesM.Reigeluth(Ed),InstructionalDesign,Theory andModels:AnOverviewofTheir CurrentStatus (New Jersey:LawrenceErlbaum AssociatesPublishers, 1983), h. 19
[7] Lizeta N. Bakola, Nikolaos D. Rizos, Athanasios S. Drigas. "ICTs for Emotional and Social Skills Development for Children with ADHD and ASD Co-existence"International Journal of Emerging Technologies in Learning (iJET), https://doi.org/10.3991/ijet.v14i05.9430
[8] Minner, Jennifer, and Jeffrey Chusid. "Visualizing thePast, Present, and Future ofNewYorkCity's1964-5World'sFairSiteUsing3D GISandProcedural Modeling."Cell607, (2017):4004.
[9] Abdul Majid, NuurWachidand Fuada, Syifaul. "E-Learning for Society: A Great Potential to Implement Education for All (EFA) Movement in Indonesia" International Journal of Interactive Mobile Technologies (iJIM), https://doi.org/10.3991/ijim.v14i02.11363
[10] Green,M.,andL.Milbourne.Makinglearning supports work. (FEMatters, 1998),p.5
[11] KnightJK,WiseSB,RentschJ.,FurtakEM Cuesmatter: Learningassistantsinfluenceintroducing thebiology of student interactions during click-questiondiscussions.CBE—Life Sciences Education. 2015;14 (4)
[12] Abowd,GD,andMynatt,ED:PastCharting, Present, andFuture Research in UbiquitousComputing, (ACMTransaction on Computer-HumanInteraction, 2000),p.29-58,
[13] Bloomberg,LECultureandcommunity:aCasestudy ofavideo-conferencedgraduatedistance educationprogram (Journalofdistance education, 2007), P. 41-58
[14] Chen,CCandHuang,TC'Learninginmuseums:developing acontext-awareubiquitouslearning environment',(Computers &Education,2012), pp.873–883
[15] Enriquez,JG'Tug-where:situatingmobilitiesof learning (t) here', (Learning, Media andTechnology, 2011), pp.39–53
[16] Chen, Guang, YuanjingZhang, Nian-ShingChen, and Zhengcheng Fan. "Context-aware ubiquitouslearninginasciencemuseumwithbeacon technology." Learning, Design, andTechnology:AnInternationalCompendiumofTheory,Research,Practice,andPolicy(2016):1-24.
[17] Low, L. and O'Connell, M. 'Learner-centric design ofdigital mobile learning', (Brisbane, Australia, 2006)
[18] Huang, Yueh-Min, and Po-ShengChiu. "The effectiveness of meaningful learning-basedevaluationsfordifferentstudentsinaubiquitouslearningcontext."Computers&Education87 (2015), p. 243-253.
[19] Enriquez,JG'Tug-where:situatingmobilitiesoflearning (t) here', (Learning, Media andTechnology, 2011), p.39–53
[20] Sugiyono.ResearchMethodology (Bandung: Alphabets,2011). H [18] GayRL EducationalResearch: Competencies forAnalysis andApplication(UnitedStatesof America:Prentice-Hall, 1996). p.12
[21] BorgR.Walter,GallD.Meredith.EducationalResearch; anintroduction (New York: Longman, 1983). p.73
[22] Pressman, RogerS. Software Engineering-Book One, Practical Approach (Issu e7). (Yogyakarta:Andi.2012) .h.12