

A REVIEW OF BLENDED E-LEARNING MATERIALS MODEL DESIGNS AND ITS APPLICATION FOR TERTIARY INSTITUTIONS STUDENTS' USE

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ABSTRACT

The research aimed at providing a guide or procedure on how to prepare and create effective and realistic blended learning materials based on reviewed literature. The objective of the study is to systematically review the existing literature on blended e-learning models. The reviewed articles used in the research work are from 2017 to 2022 covering a period of five years. Priority was given to the procedures used in the reviewed articles on designing a blended learning material. From there a conclusion was drawn by merging the ideas used in the reviewed models. The paper came up with a robust and reliable procedure for design and utilization of blended E-learning materials. The concluded procedure includes nine steps, namely Data collection, Analysis of Data, Planning, Design / Production, Testing the product, Evaluation and validation, Updating, Retesting, and Application of the final model. The researchers recommend the application of those nine steps in preparing and designing a blended e-learning materials by tertiary institutions lecturers.

Key Words: Blended E-learning, Blended learning model design, Tertiary institutions.

1. INTRODUCTION

Nowadays, it has been observed that the quality of education is going down and skills acquired by graduates do not commensurate with the expected level of education, thereby making them unproductive to meet societal needs. Large classes may be one of the causes of those problems as indicated in the study carried out by (Yelkpieri, Namale, Esia-Donkoh, & Ofosu-Dwamena, 2012), where they said large class size is one of the problems in the educational sector that developing nations have been grappling with. It does not allow lecturers to consider individual needs, because slow learners and average learners might find it difficult to cope with a highly populated class and this problem might lead to ineffective teaching and learning. Furthermore, the study conducted by (Peter & Ligembe 2022), showed that both students and teachers agreed that large class size can hinder students' performance, as 80% of the teachers and 85.1% of the students' responses showed that congested classrooms affect the performance of the students in class. The results implicated that congested classrooms prohibit effective classroom instruction. This is possible because students cannot be able to have the opportunity to interact in the learning process.

The paucity of quality teachers is another problem that might deteriorate the quality of teaching and learning. Holmqvist, (2019) was of the view that a major challenge for teacher education in the twenty-first century is to provide society with qualified teachers to teach and prepare the next generation of citizens. García and Weiss (2019), said shortage of quality teachers harms students,

teachers, and the public education system as a whole. Lack of sufficient, qualified teachers and staff instability threaten students' ability to learn and reduce teachers' effectiveness, and high teacher turnover consumes economic resources that could be better deployed elsewhere. The qualified teacher shortage makes it more difficult to build a solid reputation for teaching and to professionalize it, which further contributes to perpetuating the shortage.

Ogbu (2015) enumerated those inadequate instructional materials make teachers dissipate a lot of energy during lesson delivery without achieving much. This does hinder concrete technical instruction by teachers, thereby affecting the effective teaching of courses. Essentially it makes the teaching of courses very boring, abstract, and theoretical. The end result is that it reduces teachers' zeal and interest in teaching, decrease students' interest and zeal in lectures and learning, and hamper students' participation in lecture and instruction, hinder various classroom interaction patterns, deter students' practical skills acquisition in courses, and reduce students score in semester examinations and Cumulative Grade Point Average on graduation.

It is evident that learners experienced setbacks during the lockdown caused by the infectious disease (Covid-19). Mahyoob (2020) stated that COVID-19 has disrupted most of the industries in the world. Education is the only industry that is completely transferred to online mode in most countries around the world. Online learning was the best solution for continuing education during the pandemic, especially in tertiary education. The findings of his study showed that most learners are not satisfied with continuing online learning, as they could not fulfill the expected progress in language learning performance. This indicated the need of blended e-learning that combines the online learning and classroom learning.

Considering the challenges of large classroom size, paucity of quality teachers, inadequate instructional materials, and Covid-19 lockdown order, blended e-Learning is now seen as a palliative to solving or mitigating those challenges. E-learning is a teaching tool that provides freedom for learning, long-life, and continuous education. However, the application of e-learning is bedeviled with challenges such as internet connectivity, limited power supply, training and expertise in software development, accessing online classes, and downloading courses materials (Olutola, & Olatoye 2015) and Mahyoob (2020). This research is therefore undertaken to provide a guide on how to prepare and create effective and realistic blended learning materials based on reviewed literature.

2. THE ARTICLE REVIEW METHODOLOGY

For searching and compiling the relevant articles for literature review, database was searched thoroughly such as google Scholar, Eric, Base, Core, and Semantic Scholar. The terms used in searching the articles include Blended e-learning design, effective e-learning approach, and blended e-learning model.

The factors considered in selecting or rejecting the articles include the title, the publication date, the abstract, and the context of level of education under review. In particular, the selection was made by the date the article was published. Precedence was given to articles published over the last 5 years, which is the period when the call for use of blended learning has been advocated for in institutions of higher learning due to the lockdown order during the Covid-19 pandemic.

All selected articles were analyzed with respect to the following analysis questions

1. Does the article describe a new design approach or one that has been already discovered?
2. Does the article state the steps followed in designing the blended learning materials?
3. What evaluation process was used in evaluating the success of the designed model?

Priority was given to the procedures used in the reviewed articles on designing a blended learning material, and from there a conclusion was drawn by merging the ideas used in the reviewed models and coming up with a robust and reliable procedure for the Design and Utilization of Blended E-learning Materials.

3. CONCEPT OF BLENDED LEARNING

Blended learning is the integration of e-learning tools and ICT into the traditional educational process and teaching approaches, Amoylenko, Zharko, and Glotova (2022). It is a delivery method that combines a variety of traditional and non-traditional instructional techniques, tools, and approaches to design, develop, manage and evaluate the learning process (Almusawi 2011). It is also, expressed as a combination of face-to-face time and online time in a lesson. It can contain 20 to 80% of online session. It provides opportunity to the instructor to extend the learning outside of the classroom, therefore increasing the chances for students to link with each other, as well as the chance to lay hand on a wider range of online learning materials and technologies. (Lumena Learning 2022).

Blended e-Learning can be categorized into three (3) Low-impact blend which constitutes adding extra activities to an existing course, Medium-impact blended learning deals with replacing activities in an existing course, and High-impact blend which is building the blended course from scratch, Alammary, Sheard and Carbone (2014). Blended learning is useful, enjoyable, supportive, flexible and motivator for learners. It is also, getting more attention from all sector of learning ranging from basic institutions of learning to higher institutions. Guzer and Caner (2014). A good and effective blended learning has to be interactive which makes it possible to gain attention, to provide motivation, to achieve high levels of satisfaction and provide significant increases in learning performance, Soydaş Cakir and Akyazi (2021). To be able to carry out blended learning well, it is necessary to make policies, plans, resources (such as human resources, equipment, technology), set of schedules, and support system initiatives to be successful. In order to carry out development programs, universities must also educate academics, for example instructors in using blended learning, redesigning online courses to be effective, and effective use of technology. Krismadinata et al, (2020).

Different guides and approaches for design effective blended learning

Kristanto, Mustaji and Mariono (2017) conducted a study on “*The Development of Instructional Materials E-Learning Based on Blended Learning*”, where they came up with the following steps based on Research & Development (R & D) model for developing blended E-learning materials:

Research and Information Collecting

This step deals with retrieval of data concerning the intended blended learning instructional material ranging from the characteristics of the targeted students, instructional media, text, audio and visual resources available, and curriculum contents from the intended syllabus.

Planning

The planning step is concerned with the preparing of semester lesson plan which include the plan of face-to-face lesson and online lesson, what segment of the lesson would be taught face to face, the arrangement of the learning content and its evaluation mechanisms. Then the second segment of the lesson deals with what should be taught online by means of what medium and what evaluation method should be used.

Develop Preliminary Form of Product

The development stages of preliminary form of the product stated below: the intended lesson and content modification. In this phase, it is expected to modify the intended lesson which is created in conventional model to another model using two styles of learning that is face to face learning style and the online ones. The goal of this modification is to match the learning environment with the instructional activity and to achieve the course goals excellently; Materials framework, in this stage the researcher composed the materials that would be used in the instructional activity together with the lesson expert.

Preliminary Field Testing

This step is meant for testing the process and the developed prototype of the blended learning materials. The goals of this step are to find out the portion that need improvements and areas that need addition or subtraction of content. This could be done by experts in the intended field to give appropriate validation about the content of the blended learning material.

Instructional Design Experts' Validation

In this step design experts are required to make a trial on the blended learning model by checking its practicability with the guide of the following variables: Goals framework, Method, strategy, participation rate, and evaluation.

Material Experts' Validation

Experts are to look into the instructional materials feasibility by checking the following: laid ideology, material delivered based on the learning goals, pre-test as students' preparation, accuracy in material delivery, materials uploaded to the web as the independent learning source, learning activity to achieve learning goals exercises, and evaluation reviewing the success rate.

Media Experts' Validation

Experts on media are to validate the media feasibility by observing the following indicators: accomplished goals, practical instructions updates, accuracy, language, participation rate, practical easiness, and visual layout of the design.

Main Product Revision

The instructional design experts in this step are expected to make adjustments, editions, and reproduction of the instructional model by taking into consideration the observations made by the validators above, which is expected to make the designed model more accurate, effective, and flawless.

Hbail (2018) conducted study on “*Design A Multicultural Blended E-Learning System*” The main finding of the research suggests that the optimal blend of multicultural blended learning should be 19% still images, 23% audio files, 31% video files, and 27% text files. The design process following was used in the study

1. Identify all components of blended e-learning and assign each a weight that shows the value of the component in the blended e-learning approach.
2. List all the factors to consider when establishing a blended e-learning approach. The weight of each factor in the framework is indicated below.

The first factor is institutional in nature. Here, the instructor should address issues such as organization, administration, academic affairs, student services, organizational preparation, content availability, and infrastructure. Additionally, the instructor should assess the institution's feasibility of offering each learner the mode of delivery of learning independently as well as in a blended program. Finally, the instructor should perform a needs analysis to understand the needs of all learners.

The second factor is pedagogy. Here, the instructor should perform content, learner and learning objective analyses. Also, the instructor should analyze the design and strategy aspect of e-learning. **The third factor is technology.** Here, the instructor must create a learning environment and identify the tools needed to deliver the learning program. Additionally, the instructor should establish the most appropriate learning management system that handles multiple types of delivery and the learning content management system that catalogs the actual content of the learning program. Additionally, the instructor must acquire the server that supports the learning program and determine how the server will be accessed. Finally, the instructor must address issues such as bandwidth and accessibility, security, other hardware, software, and infrastructure.

The fourth factor is interface design. Here, the instructor must critically examine the user interface of each element of the blended learning curriculum. Additionally, the instructor should analyze the usability of the user interface and ensure that the user interface supports all elements of the mix. Finally, the instructor should pay attention to issues such as page and site design, content structure, navigation, graphics, and help.

The fifth factor is evaluation. Here, the instructor must evaluate the overall effectiveness of the learning program and must also evaluate the performance of each learner.

The sixth factor is management. Here, the instructor must pay attention to blended learning administrative issues such as infrastructure and logistics to manage multiple types of delivery. Additionally, the instructor must deal with issues such as registration and notification, as well as scheduling the various elements of the mix.

The seventh factor is resource support. Here, the instructor organizes the resources and makes them available to the learners. In addition, the instructor must ensure that he is always available either in person, by e-mail or on a chat system.

The eighth factor is ethics. Here, the instructor must consider issues such as equal opportunity and nationality.

The last factor is culture. Here the instructor must consider linguistic, social, political, economic and religious issues.

3. Determine the best combination to use to present the content of the material.

4. Explain how the content will be displayed. The instructor, with the cooperation of an educational expert, determines how the content will be displayed, the tools that will be used and the appropriate content format, for example using PDF, Presentation, Text, HTTP, Wiki and XML.

5. Decide on lesson activities: The lecturer with the cooperation of a pedagogical expert decides on the appropriate lesson activities, for example assignments, assignments, chats, glossaries and quizzes.

6. Develop and design. The teacher develops the chosen content and activities and the multicultural technician designs the multicultural then puts everything into the targeted mixed e-learning course.

7. Evaluation. The instructor ensures that the blended e-learning course follows quality assurance procedures.

8. Update. The lecturer with the cooperation of the programmer makes the final modification on the evaluation notes.

9. Allowing the blended e-learning course access.

Chaeruman, Wibawa, and Syahrial (2018) carried out a study on “*Determining the Appropriate Blend of Blended Learning: A Formative Research in the Context of Spada-Indonesia*” The main intention of conducting the research was to create a design theory, which could serve as a guide or

model of criteria for determining an appropriate blended learning strategy. The research method used in the study was formative research., which contains five steps listed below:

- 1) Form a case that helps generate a design theory.
- 2) Collect and analyze descriptive and formative data.
- 3) Revise the instance.
- 4) Repeat the data collection and revision cycle.
- 5) Fully develop tentative theory.

Figure 1 illustrated how the design theory was formed, as the first step, is to create a tentative model. The tentative model, then reviewed by experts to have descriptive and formative inputs. At the same time, the tentative model was tested to some respondents one by one (one-on-one evaluation) to have inputs from the perspective of users. Researchers, then, use descriptive and formative data to revise the model. The revised model, then be field-tested three times to different respondent until the model can be considered as the final model. In this case, until it is considered as effective and implementable.

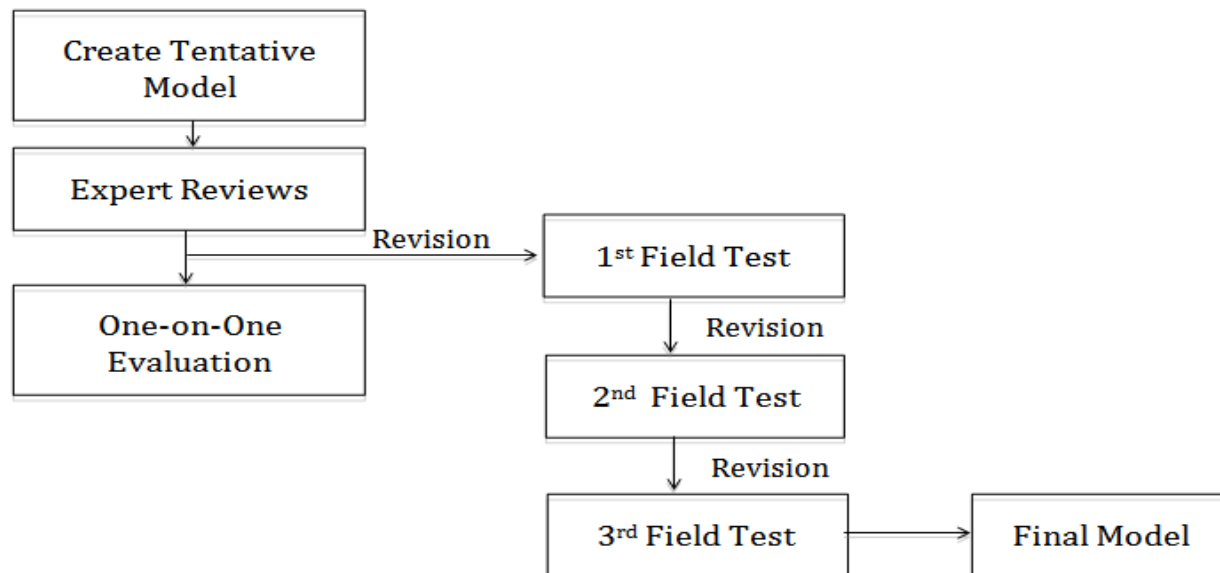


Figure: 1 model design procedure

The research instruments used in the study were questionnaires and rubric assessment. The instrument was adopted based on the PCI (Perceived Characteristic of Innovation) which measure five dimensions of innovation characteristics namely: relative advantages, compatibility, complexity, observability and trial-ability of the model.

Suartama, Setyosari, Sulthoni, and Ulfa. (2019) carried out research on “*Development of an Instructional Design Model for Mobile Blended Learning in Higher Education*” according to them Creating a successful instructional system design of mobile blended learning requires systematic planning. It might use combination of several models. They used theory of pedagogy, Moodle learning management system, in designing the blended learning. The research work was done at the Department of Primary School Teacher Education of the Faculty of Education, Universitas Pendidikan Ganesha, Singaraja, Bali, Indonesia, where they developed a mobile blended learning

design for Instructional Media course. They came up with three basic stages to be used in designing a blended e-learning material, the stages are:

The first stage is pre-analysis: To determine whether blended learning is applicable, observations and analyses have to be done using the three components below:

1. Analysis of the learners' characteristics such as previous knowledge, learning patterns, learning preferences, culture and so on.

2. Analysis of learning objects or contents that describe what should be taught about knowledge taxonomic

3. Analysis of blended learning environment, such as the environmental features.

This would permit the identification of the learners' level of proficiency and learning activities needed for building up strong base for learning organization. The pre analysis would be done by observation, questionnaires filled out by students, and documentation studies.

The second stage is design of events/activities and resources: The design of activities and resources can be divided into 1 pre-classroom learning, 2 instructional phase, 3 reviews after class and extracurricular activities, 4 training and implementation. In pre-classroom, situation the lecturer should give a framework of the intended learning content and provide required learning materials, and instructional videos by online. In classroom, environment the lecturer systematically recapitulates the knowledge and presents relevant information required for the class by onsite. In the after-class situation, the lecturer gives a summary of knowledge, extramural activities, experiments and extramural learning materials, test submission and provides amendments via Moodle Learning Management System. At the same time, the lecturer will facilitate an online discussion.

The third stage is design evaluation: These evaluation activities include evaluation for curriculum, process of delivery, and activities of the organization. To ensure the workability and effectiveness of the designed blended learning.

Mulyono, Mukhzamilah, and Rohaedi (2019) developed a model in their study "*Developing Problem-Based Blended Learning Model for Syntax Course in Industrial Era 4.0*" The model used in this study was Recursive, Reflective, Design, and Development (R2D2) design model, which described the procedure that focuses on determination, design and development, and dissemination which was modified according to the context of the development environment and needs for it to fit the situation at hand. These three focuses were the activities done during the research and development process. The implementation of each of these activities was not always linear, but circular or looped. The focus of the determination was done at the analysis stage, the focus of the design appropriated at the planning stage, the focus of the development took place at the development stage, and the focus of dissemination was at the disseminating stage where the results of product development had been prepared.

Almusawi and Ammar, (2021). Conducted research on "*The Effect of Different Blending Levels of Traditional and E-Learning Delivery on Academic Achievement and Students' Attitudes towards Blended Learning at Sultan Qaboos University*" the process of designing the blended e-learning in their research work explained below in four main stages.

I. Analysis/Design stage:

1. Describe the blended learning program overall objectives: Setting goals is an initial step to building the remaining elements of the program, as goals define the program content, educational strategy, educational media, and appropriate evaluation tools.

2. Determining the target group characteristics: such as the students backgrounds, interests and intellectual levels.
3. Determining the blended learning program content: this is concerned about the course content structure, the role of instructional media in teaching and learning.
4. Defining the learning environment: this deals with the setting of the learning environment both for face-to-face and online or e-learning sessions.
5. Determining the blended learning program behavioural objectives: this is to state the intended learning objectives of the blended learning programme, and setting out a layout on how the stated objectives can be achieved.
6. Determining the content presentation methods: the content presentation method should be planned by selecting the portion to be treated in traditional setup and determine its percentage, as well as the part to be taught using technologies.
7. Designing educational activities: A set of educational activities has to be designed by taking into consideration the theoretical and practical lessons content, and the electronic nature of e-learning.
8. Designing the educational platform: this deals with designing of the e-learning part of the blended learning programme by setting up an online study plan flowchart, preparing a Blended learning blueprint to demonstrate the program pages and hyperlinks, and designing the programme content for students.
9. Designing the interaction modes: this is concerned with student-content interaction through internal links within the content, and continuous assessment of the lessons, student-online platform interface interaction, and traditional face-to-face interaction.
10. Identifying the feedback strategy: this should be in form of self-assessment, where the students receive the outcome of their response of each question after answering it, and the teachers could assess the students and respond to them.
11. Designing the assessment tools: this is about setting the questions to determine the achievement of stated educational or behavioural objectives it could be in form of multiple-choice questions or essay, but it must measure the achievement of the learning outcome.

II. Production stage:

1. Production of the educational platform.
2. Connecting the platform with the interactive tools.
3. Initial production of the platform.

III. The evaluation stage:

1. Evaluation of the platform structure.
2. Experimentation of the platform on the pilot sample.
3. Modifications and final production of the platform.

IV. The field application stage:

1. Approval and accessibility of the educational platform.

Hamzah et al (2022) conducted a study on “*Effectiveness of blended learning model based on problem-based learning in Islamic studies course*”. The main aim of their study is to create Learning Management System (LMS)-based Blended Learning which comprise of face-to-face learning in classroom and online learning, the process that guide the design of the study was research and development (R&D).

The learning model used to develop the blended learning material was ADDIE (Analysis, Design, Development, Implementation, and Evaluation) in which they considered it as suitable for developing the correct, effective, resourceful, and supportive instructional model in the learning contents development for lecturers. Below are the activities carried out using the 5 steps in the ADDIE model.

1. Analysis. This is the first step and the activities here include a thorough analysis of the intended product which comprise the need assessment, reviewing the existing literature, conducting research using qualitative-descriptive approach to guide the need analysis for problems identification, and also, task analysis has to be conducted to control the development of the intended blended learning model.

2. Design. By considering the results of the analyses in the step one above the model development designer would develop the blended learning model. The master plan of the intended blended learning material based on problem-solving method of learning developed. Where the design, arrangement, and organization of the contents to be treated in the classroom by face-to-face and contents for online method from beginning to the end was designed.

3. Development. In this step the intended product would be developed or produced, the activities include experts to conduct validation and revision of the model. The product design result would be submitted to the professionals in the field of computer technology and information, and professional for learning materials and contents in the targeted course or programme for the production of the model. Those professionals would give their inputs on the correctness of goals, basic proficiencies, learning indicators, the accuracy of learning resources, and learning method and media used.

4. Implementation. In this step the real testing of the designed model would take place, while testing the product the observed obstacles and problems would be addressed to make the product suitable for achieving the targeted learning objectives. Besides testing for practicality and effectiveness of the product would be conducted.

5. Evaluation. In this step the designed model would be subjected to evaluation process ragging from trial testing of the real workability of the product, to validate the corrections made by the experts, and then the product has to be subjected to empirical trail testing to compere the design model with the conventional method of teaching to find out how effective the designed model is in terms of engaging the students, achievement of learning objectives, clarity and appropriateness of the model.

4. CONCLUSION

After reviewing the related literature on the **Design and Utilization of Blended E-learning Materials** from 2017 to 2022 we found out seven (7) articles that discussed extensively on the design process of the blended learning material, which is the main focus of this reviewed works. The table 1 below gives the summary of the process they employed in design their model. From there a new model and procedure for designing a blended e-learning materials model for tertiary institutions students use was produced.

S/N	Authors	Year	Articles Title	Research Method/Design	Steps involved in the design process
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1	Kristanto, Mustaji and Mariono	2017	The Development of Instructional Materials E-Learning Based on Blended Learning	Research & Development (R & D)	<ol style="list-style-type: none"> 1. Data collection and Analysis, 2. Planning, 3. Design/Development, 4. Testing, 5. Validation/ valuation, 6. Final Production.
2	Hbail	2018	Design A Multicultural Blended E-Learning System	Experimental research method	<ol style="list-style-type: none"> 1. Identify all components, 2. Analysis 3. Content mix, 4. Activities assignment, 5. Design 6. Evaluation, 7. Updating.
3	Chaeruman, Wibawa, and Syahrial	2018	Determining the Appropriate Blend of Blended Learning: A Formative Research in the Context of Spada-Indonesia	Formative research	<ol style="list-style-type: none"> 1. General Design Idea, 2. Data collection, 3. Revise the instance, 4. Repeat data collection and revision, 5. Fully develop tentative model, 6. Evaluation.
4	Suartama, Setyosari, Sulthoni, and Ulfa	2019	Development of an Instructional Design Model for Mobile Blended Learning in Higher Education	Research & Development (R & D)	<ol style="list-style-type: none"> 1. Pre analysis, 2. Design of events and resources, 3. Design evaluation.
5	Mulyono, Mukhzamilah, and Rohaedi	2019	Developing Problem-Based Blended Learning Model for Syntax Course in Industrial Era 4.0	Recursive, Reflective, Design, and Development (R2D2)	<ol style="list-style-type: none"> 1. Analysis, 2. Development, 3. Disseminating.
6	Almusawi and Ammar	2021	The Effect of Different Blending Levels of Traditional and E-Learning Delivery on Academic Achievement and	Experimental research method	<ol style="list-style-type: none"> 1. Analysis/Design stage 2. Production stage 3. Evaluation stage 4. Field application stage.

			Students' Attitudes towards Blended Learning at Sultan Qaboos University		
7	Hamzah et al	2022	Effectiveness of blended learning model based on problem-based learning in Islamic studies course	Research and Development	1. Analysis 2. Design 3. Development 4. Implementation 5. Evaluation.

Table 1 Summary of blended e-learning materials model design.

The following steps were selected and considered important due to their occurrences in the all seven (7) reviewed articles or in the majority of them, so the researchers carefully arranged the steps in sequential order that would allow the smooth execution of the blended learning design process. From there a new guide for model design was developed.

1. **Data collection.** This step deals with gathering raw facts about the blended e-learning such as: lesson or course content, students, environment, culture, technologies available, experts or personnel, and all the required resources.
2. **Analysis of Data.** This is concerned with the thorough studying of the collected data, identifying the characteristics, relevance and role of each data in the design of the blended e-learning.
3. **Planning.** This step is all about the arrangement of the all components to be used and the development of the blueprint of the targeted blended e-learning, assigning the portion of the learning content to be taught face-to-face and its percentage, and the portion to be treated using technology and its percentage, the part to be taught synchronously and the part to be taught asynchronously, planning the lesson by identifying its objectives and devising the evaluation process, and planning for the production or application of the media to be used.
4. **Design / Production.** This step is concerned with the development of the blended e-learning according to the guide of the blueprint.
5. **Testing the product.** After the production the next issue is trying the application of the blended e-learning.
6. **Evaluation and validation.** The blended e-learning has to be subjected to observations on how effective or ineffective it is towards achieving the learning objectives, which are need adjustment or improvement? So, experts need to validate the design by considering the following mechanisms; interactive, engaging, user friendly, and educative.

7. **Updating.** This step is all about making corrections and effecting the observations made by the evaluators and validators.
8. **Retesting.** After making the corrections the blended e-learning has to be retested to make sure it is flawless and effective.
9. **Application of the final model.** The designed blended e-learning is ready for use



Figure. 1: The new (nine steps) model for Design and Utilization of Blended E-learning Materials for Tertiary Institutions Students’ use.

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