# MANAGING INTERNET-BASED TUTORIAL MODULE TO SUPPORT STATISTICS LEARNING AMONG POSTGRADUATE STUDENTS: LEARNERS' NEEDS ANALYSIS

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## Abstract

Learning statistics with its mathematical nature is one of the principal stumbling blocks among university students in various faculties. Hence, managing an internet-based tutorial module to support students is value added specifically, when this online tutorial module is well organized in line with learners' needs and characteristics. Instructional design is defined as a combination of approaches arranged to improve the instructional programs and educational methods. Analysis as the first phase of generic ADDIE model is usually downplayed through instructional design processes. This study focuses on the analysis of target learners concerning characteristics of learning environment and effective strategies for collaborative online learning by reporting and generalizing results from an evaluative single case study. This design was based upon observation and discussion conducted in a face-to-face statistics course and asynchronous communication managed by Facebook -as a discussion forum- to analysis the stakeholders needs and organize an Internet-based tutorial module. The 27 students in this course used this Facebook page daily and engaged in threaded topic discussion within 6 weeks. The central results reported from the analysis phase of ADDIE process, as a crucial element for the success of the whole endeavour of ***i***-TModule development. Actually managing the module properly without these results is not easy or straightforward. The analysis framework presented in this paper could be useful in other similar learning situations especially whose involves online interaction in a conventional face-to-face setting.

**Keywords** *ADDIE model, analysis of learners, on-line learning, tutorial module, statistics learning.*

## Abstrak

Pembelajaran statistik adalah pembelajaran bercirikan matematik yang sering merupakan halangan utama dalam kalangan pelajar universiti di pelbagai bidang. Oleh itu, pengurusan modul tutorial berasaskan internet untuk membimbing pelajar dalam pembelajaran statistik adalah suatu yang *value-added*, sekiranya modul tutorial dalam talian ini diatur dengan baik sejajar dengan keperluan dan ciri-ciri pelajar. Ini adalah sejajar dengan konsep reka bentuk pengajaran yang ditakrifkan sebagai gabungan pendekatan-pendekatan pengajaran diatur untuk meningkatkan pembelajaran dan kaedah

pendidikan. Rata-ratanya, model ADDIE sering memandang ringan terhadap fasa Analisis iaitu fasa pertama dalam proses mereka bentuk pengajaran. Kajian ini memberi tumpuan kepada fasa Analisis iaitu meneliti sasaran pelajar khususnya tentang ciri-ciri persekitaran pembelajaran dan strategi yang berkesan untuk pembelajaran dalam talian dengan melaporkan dan membuat kesimpulan hasil daripada kajian kes tunggal. Reka bentuk ini adalah berdasarkan kepada pemerhatian dan perbincangan yang dijalankan secara bersemuka dalam kursus statistik dan melalui *asynchronous communication* Facebook sebagai forum perbincangan bagi menyediakan dan mengatur modul tutorial berasaskan Internet yang menepati dengan keperluan pelajar. 27 pelajar dalam kursus ini telah menggunakan laman Facebook ini setiap hari dan terlibat dalam perbincangan talian tentang topik statistik bagi tempoh masa enam minggu. Keputusan utama dilaporkan daripada fasa Analisis dalam model ADDIE, menunjukkan elemen-elemen penting untuk kejayaan keseluruhan usaha pembangunan ***i***-TModule. Dapatan menunjukkan bahawa menguruskan modul dengan betul tanpa menganalisis fasa ini adalah langkah yang tidak baik. Rangka kerja analisis yang dibentangkan dalam kertas kerja ini boleh menjadi berguna dalam situasi pembelajaran bagi kursus lain, terutama yang melibatkan interaksi dalam talian bagi persekitaran pembelajaran konvensional bersemuka.

**Kata Kunci** *Model ADDIE, analisis pelajar, pembelajaran dalam talian, modul tutorial i-TModule, pembelajaran statistik*

## INTRODUCTION

In 1978, Wolfe emphasised the increasing importance of quantitative research in social science, hence, many students need to take statistics courses in order to strengthen their ability to interpret and predict from gathering data in their researches. These abilities can specifically provide higher-order thinking skill for postgraduate students in the social science. At tertiary level, statistics is universally accepted as one of the main components of almost all studies; although, graduate students often view it as the biggest hurdles (Coetzee & Merwe, 2010). In education and social science area, many higher learning institutions have made educational or social statistics courses as a general requirement for the students (Thompson, 2009). However, many researchers also showed that for many students in all faculties, the subject of statistics is one of the principal stumbling blocks (Groeneboom, Jong, Tischenko & Zomeren, 1996).

According to students' problems with statistics, they may often postpone enrolling in educational statistics courses until the last semester of their degree programme (Groeneboom et al., 1996). However, for social and educational science students the condition is worse and many of them usually complain about taking statistics courses (Forte, 1995; Royse & Rompf, 1992). Researchers declared that some of the reasons behind this behaviour are fears and anxieties on the subject of statistics as well as feeling indecisiveness due to lack of basic knowledge in statistics or the concern about proper use of statistical applications (Macher et al., 2012; Onwuegbuzie, 2004; Royse & Rompf, 1992). For example, the study conducted by

Royse and Rompf (1992) showed in an introductory statistics course, the students take fewer mathematics courses in high school and college reported higher levels of mathematics anxiety. Actually, this can be the demotivating reason, for both students and teachers. Subsequently, the raised concern calls for a more flexible technique and alternative approach with higher efficacy in teaching statistics.

Instructional design can be defined as a combination of approaches arranged to improve the instructional programs and educational methods in a steady or dependable manner. It allows the trainers to control the training procedure by following the instruction orders in a rational way. Generic model of instructional design consists of five main conceptual components combined, as a term is known ADDIE, an acronym term for Analysis, Design, Development, Implementation, and Evaluation. Among all the systematic instructional design approaches, which have been put forth, ADDIE is one of model to develop training design and programmes, find the materials for implementing the programmes that meet the needs of training and also evaluate the efficacy of the created training (Allen & Dobbs, 2007; Gagne et al., 2005).

Gustafson and Branch (2002), and Gagne et al., (2005) described each step of the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) with an outcome, which then leads it into the next step in the model. The first step known as Analysis in which all the goals, objectives, audience needs would be recognized, and it also includes the other factors, which are able to impact the creation or the progress of the project. Analysis is a crucial component of ADDIE as a step to organize the overall design aims (Ellington & Aris, 2000); however, it has been downplayed and appeared less important than it really is in instructional design. As a case in point, a few researchers have attempted to make an Internet-based environment compatible with different learning styles (Paredes & Rodrigues, 2004). This paper provides an overview of the analysis the needs to organize an internet-based tutorial module for learning statistics and collocated much of the research carried out so far into a framework. While most of the literature so far has concentrated attention to the contribution of learners through ADDIE process (Dick et al., 2009), this paper focuses on the value added of field trial analysis of needs to the pedagogical planning and organizing of the new instruction in this generic instructional design model. Specifically, this study is going ahead with analysis to answer what strategy and organization is needed to drive a successful Internet-Based Tutorial Module (*i*-TModule) in order to support statistics learning among postgraduate students.

### *Learning Needs Analysis*

According to Dick et al., (2009), the aim of this phase is to analyze the learning needs and find out what are the factors that should be considered in the learning module. Learning needs analysis includes three aspects as follows:

1. Needs analysis to determine the extent to which learning needs exist and cover what should be exist (Chen, 2011; Rodriguez, 1998),

2. Learner analysis to identify learners characteristics with specification of individual differences which can affect the learning process (Chen, 2011; Schwen, 1973),
3. Context analysis to review of the settings in which instruction takes place and parameters involved such as facilities, and equipment (Dick et al., 2009; Tessmer, 1990).

Therefore, this phase is going to recognize all the goals, objectives, audience, and the other factors, which can have an impact on the progress of the instructional design. Figure 1 illustrated the framework adopted by the researcher in the Analysis phase. The analysis phase started with a focus on an idea to create the new learning environment with effective instructional strategy, which then leads to critical and creative ideas related to the new instructional design (Hannafin & Hill, 2002). Several questions such as "what are the problems or needs? What are the parameters of the problem of need? What should the content be?" should be answered at the end of Analysis phase (Seels & Glasgow, 1998).

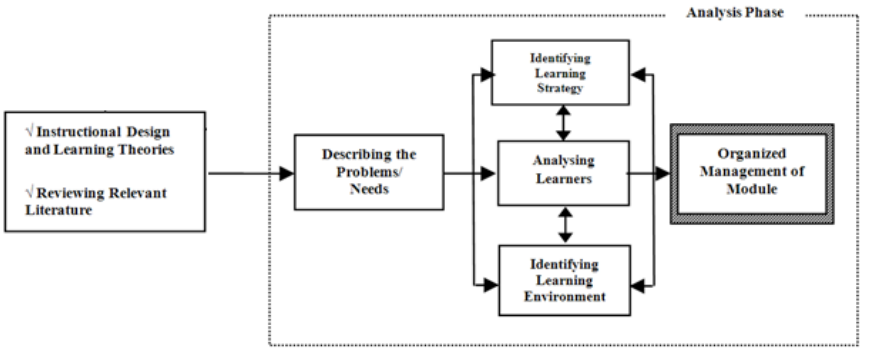


**Figure 1** The Operational Flowchart of Analysis Phase

The reviewing of literature explicated some of the gap existed in the conventional teaching methods of statistics; for example, most of approaches in teaching statistics are teacher-centred methods while the stress of current literatures are on the students-centred methods (Johnson et al., 2000; Sosa et al., 2011). The analysis phase was also carried out in order to ascertain the preferred Internet-based learning environment or the ***i-***TModule. Accordingly, the analysis phase if done properly would help to create the outcome as a robust foundation and guideline for carrying out the design, development, implementation, and evaluation phases of ADDIE.

## DESIGN AND METHODOLOGY

Stake (1995) identifies single case study research, or a single "instrumental" study, as a study in which researcher focuses on a particular issue and concern, then selects a specific bounded system or "case" to examine that issue. This study designed as an evaluative single case study with only one case that has been taken under investigation. The evaluated case study was used to describe the learning needs to organize the

internet-based tutorial module (***i***-TModule). The main aim of this evaluative single-case study was to observe learners and instructor, as well as collecting some information by collecting target learners' feedback. The subjects were 27 postgraduate students who enrolled in the course entitled "statistics for educational studies" in faculty of educational studies. The study was conducted for duration of six weeks in an academic semester.

The data collection was conducted in two modes, in face-to-face classrooms, and online via an Internet-based mediated platform. Facebook was chosen as an Internet-based mediated platform for analyzing the learners, learning environment, and learning strategy. In order to provide in-depth information on the examination of learning needs, a Facebook community page titled "Basic Statistics in Education" (Figure 2) was created as a platform to collect operational details for analysing the stakeholders' needs, check the potential of a simple facilitated e-learning model, and estimating the level of participants' interaction.


**Figure 2** Facebook Community Page, Basic Statistics in Education

Mavroudi and Hadzilacos (2013) declared about the flexibility in the needs analysis through integrating various techniques such as: (a) observation, (b) debriefing, (c) document analysis, (d) questionnaire, and (e) estimation. Hence, these multiple source of techniques were employed to answer the research question proposed in this study. Observations have been done in 6 sessions of face-to-face course. Debriefings and discussions were conducted informal and formal with students and the course lecturer by way of face-to-face sessions as well as the platform. The students' weekly assignments as learning documents were also analyzed. Moreover, students' interaction within the platform analyzed and consequently, their learning behaviour were estimated. Finally, a questionnaire was used as pre-testing to estimate the participants' demography, prior knowledge, and find to what extent the target learners digitally literate. The outputs generated in this analysis phase were discussed in the following section. Generally, the outputs focused on the criteria and needs of the desired learning environment with maximum ability to support the learners.

### *Analysis of Needs to Organize the Internet-Based Tutorial Module*

The findings of study are presented in three main areas consisting of: analysis the learners, identifying the strategy, and learning environment. Each of the three areas

is explored, the advantages that ***i***-TModule could bring to help learners and fill up whatever inquiries to that of teacher-led instruction are analysed, and possible ways ahead are indicated.

**Describing Instructional Problems or Needs**

The clarification of the instructional gaps (between "what is" and "what needs to be" in the instruction) help to remedy the lack of skills or knowledge (Koneru, 2010). The emphasis of this step was to determine the needs or problems, which the learners encountered when they try to acquire skills and information. Those skills that learners are required to be proficient in after completing the course, are known as instructional goals (Dick et al., 2009). Therefore, clarifying and identifying the instructional goals or objectives are fundamental to the ***i***-TModule.

The Educational Statistics course was offered in a regular academic semester for all postgraduate students interested in quantitative research by the Faculty of Educational Studies at UPM. In a debriefing session with the lecturer, she clarified that it is expected that students are able to acquire the statistical concepts and the statistical methods for data analysis in a social sciences research at the end of this course. Additionally, they should be able to use statistical procedures for describing and interpreting the quantitative social science research results.

Within the first debriefing, students mentioned serious worries about the gap between their last attendance in mathematics courses and current course. At the end of first session, they received a set of exercises as a weekly assignment need to be submitted at the following session. Anxiety of learning statistics and solving statistics problems were mostly complained by the students because of statistics' mathematical nature and formula in the second debriefing. The information obtained by observation during these face-to-face sessions remarked the salient points experienced by the target students as follows:

1. A passive role as a learner in the traditional class seems to be boring, because most of them are teachers,
2. Low confidence, accordingly they expect to be confirmed by an expert in every single step of problem-solving,
3. Low level of skill in solving the problems among students, and they asked for coaching and scaffolding during class,
4. Different kinds of learners exist in the class,
5. The lecturer cannot help learners as much as they had wanted because of the limitation of time in a weekly three-hour class,
6. Students do not have much interaction between each two sessions of class, because as adult learners they have some specific occupations.

The communication through Facebook could capture the students' needs as well as their perceptions about Internet-based interaction after second sessions. Most of comments showed their needs of assistance after face-to-face classrooms (Figure 3).

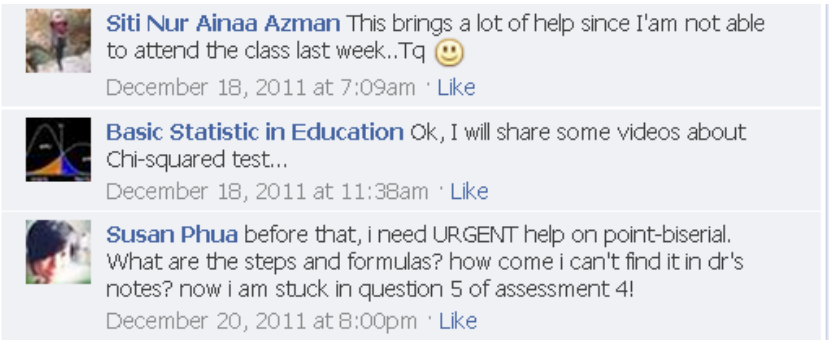


**Figure 3** A Snapshot of Learners' Feedback

Hence, the ***i-***TModule to be designed should support students and implement the face-to-face classroom sessions by covering the gaps to achieve the course objectives. Additionally, the reason for seeking the new Internet-based environment was to search for new opportunities for both teachers and learners and aimed to enhance the current teaching approach. Therefore, the initial needs of the Internet-based instructional environment were explicated by the conversation with the stakeholders (which are the target learners (e.g. Figure 3, 4), and the lecturer).


**Figure 4** A Snapshot of Learners' Feedback

From the students' point of view, the module would: (a) provide flexibility to access course materials and information before attending the class, (b) decrease worries of incomprehension and misunderstanding the concepts in the class, and (c) increase the possibility of getting assistance and guidance after the class, especially when they are working on the assignments. From the lecturer's perspective, the new environment would be (a) easy to access for users, (b) in line with the current teaching approach, and (c) decreasing barriers to manage the course materials and administrating. The responses from both the learners and the lecturer clarified the existed needs of the instructional design.

### *Analyzing the Learners*

The target of analyzing the learner profile was an attempt to incorporate learning style into the learning strategy as well as the learning environment. This could adapt learning sequences and structure in order to improve learning and teaching process, spent less

time and obtained better learning experience (Paredes & Rodriguez, 2004). In order to improve the objective information, some other features of the learners were provided by demography of the learners, such as age, race, full-time vs. part-time students, students' prior knowledge shown in Table 1.

**Table 1** Subject Profile and Pre-testing Information

| No. of Participants | Gender | | Programme | | Job Status | | | Prior Knowledge | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Master | PhD | Part-Time | Full-Time | Others | BM | MCT | DD |
| 27 | 6 | 21 | 25 | 2 | 8 | 12 | 7 | 75% | 45% | 47% |

The pre-testing was conducted to investigate to what extent they could remember what they learnt before. The test was included three parts to assess students' knowledge in three topics as Basic Mathematics (BM) required for statistics learning, Measures of Central Tendency (MCT) topics, and Displaying Data (DD). These implicit features revealed a wealth of information about the users to create preferred Internet-based module, for instance, the range of target learners was between 24 to 45 years old, all of them know some simple concepts in statistical measures of central tendency. The underlying ideas taken from this information, allowed the researcher to adapt the presentation of the ***i-***TModule based on target learners' characteristics. The students' prior knowledge for BM was 75%, which was respectable. Moreover, the rest major topics were measured almost 50%. However, as a noticeable case, the results showed that while they had learnt simple concepts about measures of central tendency (Figure 5), they needed to be reminded in details and specially learned how to work on displaying grouped data with diagrams.

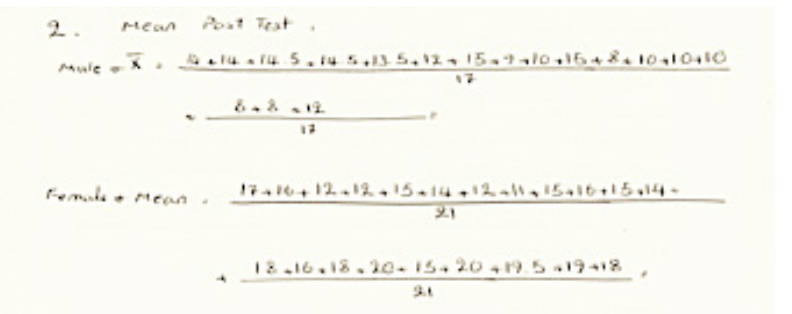


**Figure 5** A Learner's Response on Doing Mean

Felder and Soloman (2000) introduced four categories of learning style namely, active/reflective learners, sensing/intuitive learners, visual/verbal learners, and sequential/global learners. As explicit information, it is assumed that in a normal classroom there exist learners with different abilities. However, it was not clear which aspects of the learning styles are worth modelling (Paredes & Rodrigues, 2004). In the Facebook community page, the students totally inspected 183 times to view 45 notes posted on the wall toward dealing with different types of resources and materials were posted and shared in the page. Results are shown in following table (Table 2).

**Table 2** Facebook Activities Evaluation

| | Number | Admin Posts | | | Students' Posts | | |
|---|---|---|---|---|---|---|---|
| | | Videos | Example Solutions | Notes in Pdf | Videos | Example Solutions | Others |
| **Posts** | 45 | 15 | 15 | 10 | 1 | 2 | 2 |
| **Likes** | 183 (100%) | 115(63%) | 36(20%) | 11(6%) | 9(5%) | 4(2%) | 8(4%) |

Among these recourses, the most visited and liked posts were YouTube instructional videos posted by admin or students. They favoured visual learning materials as the most interesting, with total 68% (which were 63% admin posts and 5% for students posts) of the entire likes by students. Next materials were worked-examples problems as problems with solutions related to the assignments with 22% of total likes as 20% for admin posts and 2% for others posts. These all were besides 10 % for likes of the available resources shared in the mentioned page with 6% for admin posts and 4% others. Therefore, to cover the needs of all learners with different learning style, a variety of course materials (e.g. PowerPoint, PDF, audiotape, videotape) would be provided for each topic. In this case, the learner is able to take the best material, which is most effective according to her/his learning style and character.

### *Identifying the Learning Environment of i-TModule*

The context analysis is the activity to identify the learning environment. During context analysis, the focus is about the vision of the learning environment and to identify how to form it (Dick, 1997). The learning context needs to be analyzed before developing modules and designing the environment. According to Koneru (2010), the designer should check:

1. The availability of the appropriate technology and necessary support, for learners and instructors,
2. The ease of using the necessary plug-ins to access the learning modules, in the mediate tools, by learners,
3. Possessing the required knowledge, skills, and attitudes for updating the content and using the technological tools by instructors.

To address this issue, the following points were considered to identify the appropriate learning environment. First, data gathered from the questioning about accessibility of the Internet among target learners showed that all of the students have access to the Internet every day. Since, prospective students showed that they already had Internet access daily and were digitally literate. These results confirmed that an online learning environment would be more appropriate.

Review of the related literature suggested the provision of an interactive environment for teacher and learners (e.g. Liaw & Huang, 2013; Wilson & Stacey, 2004). Zhang et al., (2004) also mentioned about how e-learning can significantly

complement the traditional classroom, and they explored the advances of the use of multimedia materials as a promising alternative to traditional courses.

After six weeks of implementation, the results of 27 students' activity with 183 visits could meet the desired needs of students' encouragement by Internet-based learning. It seemed to have enough potential to cover the needs of the context analysis. Some positive features and technical characteristics were (a) no cost was needed to have a Facebook community page, (b) no need to install any hardware, or software, (c) so friendly and intimate among students and youth, and (d) no need to have an Administrator highlighted these potential. However, Facebook could not cover the requirement for reconsideration of the prototype implementation because of some weaknesses verified as follows:

1. Tracking the posts was difficult because in any one screen only a few events were visible,
2. The user cannot type mathematical symbols in the comments,
3. Sorting the materials according to each topic was not possible,
4. Finding one specific post among the archive was boring and time consuming,
5. Level of interactivity was not at the desired level.

A learning environment is "a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" (Wilson, 1996, p.5). Many Internet-based learning environments like Learning Management System (LMS) can be suggest for overcoming to these weaknesses. Currently, LMS as a software system is very common in the academic learning system. Among all LMSs, the financial and technical constraints limited the choice of a mediated tool (Machado & Tao, 2007). In this study, the researcher had to determine the cost-effective development software from the available systems. The researcher sought the other researchers' advices (e.g. Machado & Tao, 2007; Martinez & Jagannathan, 2008) about the best choices among LMSs. Moreover, the suggestions by other researchers and educators identified that Moodle, as an open source LMS could support and encapsulate the desired characteristics. On the other hand, Jonassen (1999) has identified five characteristics of a constructivist learning environment: problem space, related cases, information resources, cognitive tools, and conversation tools.

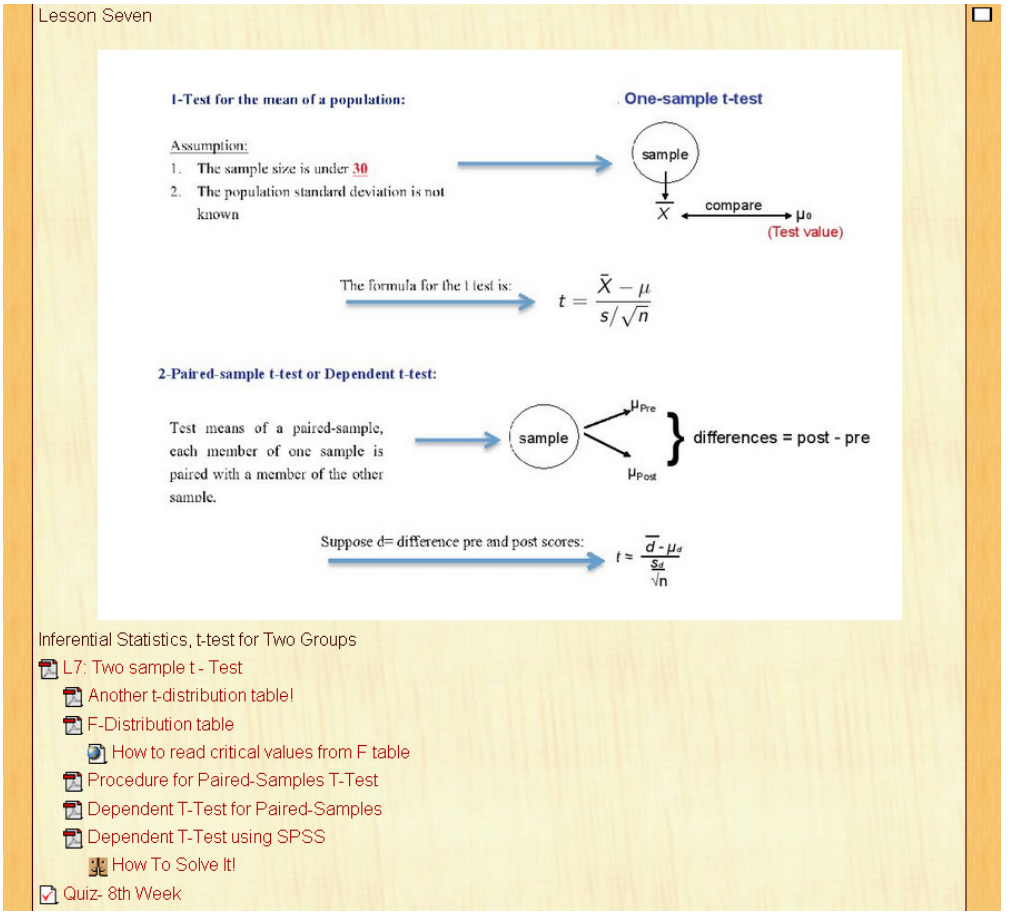


**Figure 6** Module Topic Outline in Lesson Seven

Figure 6 showed some desired features required to include in lesson seven as available feature. Moodle as an LMS can provide a specific space for creating course outline and extra materials (Martinez & Jagannathan, 2008). As a learning space, it allows the instructor to generate a space for introducing some authentic problems out of textbooks in which students can get involved in the activities (problem space). This software also can be used to provide and share a database of related cases. These cases such as the real exercises, which have been done before by accessing the previous experiences can guide students to the solution. Moodle has this ability to introduce and link to other related resources (related cases). In addition, for developing problem-solving skills, students need to learn and access to domain-relevant knowledge and skills (Hooper & Reinartz, 2002). In Moodle environment, information and resources can be provided in different banks of data such as multimedia, video, audio, document, and Internet-base resources (information resources). Moodle has this ability to set up some resources and activity (such as video, mind map, java applets,...) which can develop students' level of mental processing (refer to cognitive load theory of Cooper, 1998) which they need during problem-solving. These tools, like mind maps, Geogebra Spreadsheet, online calculator, glossary can be used in a Moodle site (cognitive tools).

Furthermore, chatroom and forum are two main established conversational tools in Moodle in which learners have the opportunity to have insights into others' experiences and thinking processes. It can improve the quality of learning by increasing the chances for help and practice on conversational tools (Hooper & Reinartz, 2002).

### *Identifying the Learning Strategy of i-TModule*

As a matter of fact, some students normally need to put in more efforts due to different learning needs, while some others are standing in a good level of understanding during learning (Christensen, Horn, & Johnson, 2011), hence appropriate teaching strategy needs to be incorporated into the traditional learning process. Modelling, Coaching, Scaffolding, or Cognitive apprenticeship, as inherently social learning approaches are beneficial approaches to assist novices while they follow the experts. The instructional outcomes are closely dependent upon the design features of the materials and the nature of activities. Moreover, a better appreciation of the pedagogical principles that underlie e-learning, the development of a more advanced psychology of human learning, the development of better learning environments, the design of accessible and usable e-learning systems, the development of ambient intelligence and smarter systems, and a greater appreciation of the potential synergy between cognitive and emotive factors in human learning are a number of issues, controversies and problems that relate strongly to employment of cognitive learning approaches to the design of accessible e-learning systems (Adams & Granic, 2009). Cognitive apprenticeship was adopted in this Moodle-based environment to help novices to become experts in statistics problem-solving.

The Cognitive Apprenticeship Model (CAM), chosen to drive as instructional strategies on the ***i***-TModule, would provide an agenda to mark the learning strategy. Collin (1991) and Brown et al., (1989) identified four aspects, or blocks to build a cognitive apprenticeship learning environment. These 4 building blocks and their 17 features shown in Table 3 were the outlines to identify the needs of the learning strategy. These features provide a perspective framework to design suitable strategies.

**Table 3** The Aspects of Designing Cognitive Apprenticeship Environment

| No. | CONTENT | TYPES OF KNOWLEDGE REQUIRED FOR EXPERTISE |
|---|---|---|
| 1 | Domain Knowledge | Subject matter, specific concepts, facts, and procedures |
| 2 | Heuristic Strategies | Generally applicable techniques for accomplishing tasks |
| 3 | Control Strategies | Generally approaches to directing one's solutions process |
| 4 | Learning Strategies | Knowledge about how to learn new concepts, facts, and procedures |

| | METHODS | WAYS TO PROMOTE DEVELOPMENT OF EXPERTISE |
|---|---|---|
| 5 | Modeling | Master performs a task, so students can observe |
| 6 | Coaching | Master observes and facilitates while students perform a task |
| 7 | Scaffolding | Master provides support to help students to perform a task |
| 8 | Articulation | Master encourages students to verbalize their knowledge and thinking |
| 9 | Reflection | Master enables students to compare their performance with others |
| 10 | Exploration | Master invites students to pose and solve their own problems |
| | **SEQUENCING** | **WAYS OF ORDERING LEARNING ACTIVITIES** |
| 11 | Increasing Complexity | Meaningful tasks gradually increasing in difficulty |
| 12 | Increasing Diversity | Practice in a variety of situations to emphasize broad application |
| 13 | Global to Local Skills | Conceptualizing the whole task before executing the parts |
| | **SOCIOLOGY** | **SOCIAL CHARACTERISTICS OF LEARNING ENVIRONMENTS** |
| 14 | Situated Learning | Students learn in the context of working on real tasks |
| 15 | Culture of Expert Practice | Communication about different ways to accomplish meaningful tasks |
| 16 | Intrinsic Motivation | Students set personal goals to seek skills and solutions |
| 17 | Cooperation | Students work together to accomplish their goals |

**(Source: Adapted from Collins, 1991)**

The designed strategies can incorporate with characteristics of the learning environment in the implementation of the Cognitive Apprenticeship Model, the ***i***-TModule. Consequently, from a perspective of this model, learning occurs through participation in the community. Learning from participation and intervention can be categorized into three types of interaction (Moore, 1989); (a) learner-learner, (b) learner-content, (c) learner-instructor. The nature of Internet-based learning environment needs the identification of specific tools according to the strategy, which can drive the instructional goals. Usually instruction happens in a synchronous environment when there is interaction between learner and instructor. On the other hand, according to Dempsey and Van Eck (2002), the non-instructional concern, which may be more significant in an academic instruction, tend to have an asynchronous environment and allow a student to attend class activities at "odd hours." As a result, the synchronous and asynchronous strategy, according to the components of CAM, should be designed into the ***i***-TModule.

## DISCUSSION AND CONCLUSION

The nature of ***i***-TModule is supposed it to be a supplemental instruction designed to improve the students' problem-solving skills. The traditional face-to-face classroom is teacher-centred, so the teaching approach is static. In this case, to achieve the instructional objectives, a dynamic perspective has been identified by using the ***i***-TModule. The mean of dynamic perspective is to allow different learners with different learning styles to exercise their own learning strategies. They would improve their skills in the process and corrected them if their effort does not work or goes wrong. Therefore, the design of the ***i***-TModule included materials and activities is supposed to accommodate efficient and effective employment of the tutorial instruction regarding to statistics learning improvement. Before developing the module, this study was organized through an evaluative single-case study, which provided enough evidence to describe the problems or needs. Align with the needs of stakeholders, the factors considered in creating the ***i***-TModule are considered as follows:

1. Developing an environment to improve learning experiences in a meaningful practice field,
2. Providing students the opportunity to develop higher problem-solving skills,
3. Managing own learning time by students,
4. Working in teams to solve ill-structured real-life problems,
5. Improving students' motivation to use the provided modules,
6. Providing flexibility to access the learning materials and supporting activities,
7. Designing an asynchronous environment, this lets learners to attend the class activities at their convenience (e.g. odd hours),
8. Adopting CAM as instructional strategy to be employable by the Moodle's features,
9. Reaching out to students with different learning styles.

This paper tries to show steps of clarifying the instructional goals and objectives to provide substantial learning outcomes as the basis of the instructional design. This attempt was seeking to gain learners' attention before they challenge to learn, as well as support the trend and concern for instructional design material. Reducing irrelevant processing of learning was also considered by highlighting the essential materials or managing essential handing out as consideration of the cognitivism point of view, and employing cognitive apprenticeship model in a asynchronous Moodle-based environment as constructivism perspective which has been mentioned earlier to support this online tutorial module in Internet-based instruction. Finally, this study could provide quite complete answers for the three major questions (Seels & Glasgow, 1998) included what are the problems/ needs?, what are the parameters of the problem/ need?, and what should the content be?

Methodologically, after the completion of the analysis phase, the development of the course curriculum, ensuing lesson strategy, learning activities, learning material, and resources are followed in the Internet supported tutorial between the stakeholders of the statistics course. If these phase of ADDIE process can be conducted properly to

clarify the stakeholders needs, not only can minimize effort and cost, but also have a positive impact on the effectiveness and the ease of usability of the online instruction.

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