A Hybrid Course for Probability and Statistics for Engineers: A Readiness Study at Shahid Beheshti University

Abstract—Probability and Statistics for Engineers covers verities of subjects in the set theory, the combinatorial analysis, probability, statistics, and (in some universities) the stochastic processes. Since, course receives only 3 credits it has to be taught 3 hours/week. This overloading content along with time limitation make course as a challenging and difficult one for students. Also, many instructors, including the first author, found the course very challenging to teach. Two popular on-site and e-learning training systems do not provide any appropriate solution. This article suggests a hybrid training system, which combines some elements of both training systems to reduce the disadvantages of both systems. Readiness of such hybrid course is measured by preparedness of students for online activities. The readiness study at Shahid Beheshti University shows that Internet skills, self-directed learning, learner attitude toward e-learning, e-mail skills, and software ability of students are factors which are significantly affect readiness of students.

Index Terms—Readiness, Hybrid course, Probability and Statistics for Engineers, E-learning.

I. INTRODUCTION

Probability and Statistics for Engineers is one of the challenging courses for both instructors and students in engineering. Overloading of the course content, time limitation, and simultaneous offering the course with several difficult courses (such as fundamentals of physics, multivariate calculus, differential equations) transform an interesting course to a difficult one. Some instructors suggest dropping some less important materials of the course, and teaching the rest with more care. But, the majority of them believe that the course contents have been chosen based upon students’ needs in other courses and their research. Therefore, it is reasonable to employ a training system which have non time limitation and can be adapted based upon learners’ abilities.

An e-learning training system can provide an interactive, individualized, and repeatable environment to teach a subject. Universities are witnessing many benefits of e-learning, such as cost saving, in creating file flexibility, productivity, rapidly developing, deploy and update a course, providing an effective training system, availability anytime and anywhere, providing broadly training opportunities, staying competitive, improving motivation and morale, and implementing strategic initiatives more effectively (Bonk, 2002; So and Swatman, 2007; Minton, 2000). On the other hand, there are situations where an e-learning training system is not an appropriate one. Many instructors believe that mathematics and statistics need the traditional face-to-face training system and they cannot teach using an online training system and they cannot teach using an online training system (Broadbent, 2001 and Chapnick, 2000).

To overcome such barriers and limitations, several authors suggest using a hybrid course; see Garnham and Kaleta (2002) and Sands (2002), among others for more detail. Many universities have sought to develop their own hybrid learning courses as another option for students and instructors who prefer to replace some portion of traditional face-to-face meeting time with online instruction (Olapiriyakul & Scher, 2006). In a hybrid training system, similar to the traditional training system, students participate in a classroom and earn significant portion of the course on-site. But, some complimentary activities such as advanced topics, assignments, quizzes, more examples, and etc are moved to an online part. The goal of hybrid courses is to join the best features of in-class teaching with the best features of online learning to promote active independent learning and reduce class seat time (Garnham and Kaleta, 2002). Moreover, Arbaugh (2000) pointed out that hybrid courses may be acco mpanied benefits of both on-site and e-learning techniques to reduce disadvantages of both techniques. To have a successful hybrid course an instructor must invest significant time and effort in redesigning a traditional course. Since, online activities require special abilities, equipment, and etc. of learners. Garnham and Kaleta (2002) pointed out that readiness of a hybrid course measured by preparedness, mentally or physically, of learners in online activities.

Sands (2002) described how one may integrate online activities with classroom work to obtain a successful hybrid course. Based upon Sands’ suggestions, our experience, and several in-depth interviews with some experts and instructors, we decide to design a hybrid course, which (i) the course contents teach in the On-site part; (ii) Class materials companies with some new examples and more advanced materials as well as quizzes and assignments are moved to the On-line part.

This article reports the readiness of Shahid Beheshti University (say SBU) students, who registered the course in 2009 winter semester. This article develops as the following. Section 2 reviews some relevant literature regarding readiness. Research’s hypotheses as well as statistical methods are given in Section 3. Research’s design is given in Section 4. While Section 5 represents results of the research. Finally, Section 6 provides a conclusion regarding our findings.
II. LITERATURE REVIEW

Webster’s New Collegiate Dictionary defines readiness as being prepa red, m entally or phy sically, for som e experience or act ions. B orotis and Poulymenakou (2004) defined e-learning readiness of an organization as preparedness, m entally or phy sically, for s ome e-learning ex perience or actions.

Kaur and Abas (2004), Anderson (2002), Bean (2003), Chapnick (2000), Clark and Mayer (2003), and Gold et al. (2001) are authors, among others, who discussed the necessity of a re adiness study in an e-learning training system. Th ey war ned that with out a careful pl an ning most likely an e-learning system will be ended wi th cost over-runs, unappealing t raining pr oducts, and failure. M ore-over, they stated that (similar to any other major innovations) e-learning st rategies require co nsiderable up-front analysis, developm ent tim e, m oney, technological infr astructure, and leadership su pport to be successful. Therefore, managers must as sess their companies’ readiness for an e-learning system, before im plementing th is innovation. Several authors st udied factors which m ay affect readi ness of t udents. T able 1 summarizes some of their results.

III. VARIABLES AND HYPOTHESES OF RESEARCH

A two-section su rvey en titled, “e-Learning Readiness Survey” has been developed to assess e-learning readiness of st udents at SB U, wh o r e gistered t he course in 2009 winter semester. Th e fi rst section consisted of 5 items to gather data about demographic character istics, such as gender, schola stic success which is measured by Gra d average, Point Average, GPA), major, computer usage, and Internet usage in the week who takes the survey. The second section included 41 items to as sess RESPON DENTS’ SELF-REPORT perceptions of their readiness for the course. Now observe that: (i) th e On-line part o f th e hy brid training system is a new part, which added to the traditional part. Therefore, it is reasonable to measure readiness of learners for a hy brid training system through their readiness for an online training system; (ii) R adiness def ines based upon mental and phy sically preparedness of students who will participate in the course. From these observations one can conclude that, readiness of the hybrid training system (dependent variable) can be measured, only, by students’ online preparedness, mentally and physically, using questions 1 to 9. It is worth to mention that questions 1 to 5 assesses the mental readiness while questions 6 to 9 assess the physical readiness of students in the survey.

DeVellis (2003) indicated that the first step in developing an instrument is, clearly, determining what it is the researcher wants to measure. The variables, or factors, of this research identified after detailed analyses of items in the questionnaire. As a result, 12 major factors that can be helped organizations to measure how ready they are for an e-learning training system are identified.

Based upon previous researches, partly given in Section 2, a questionnaire developed to measure readiness of a learner for the online course. Appendix A represents the questionnaire items as well as their sources. Now, the following present the hypotheses of this research.

Hypothesis 1. Skills of users influence on learners’ readiness for an online course.

Learners with high skills have more confidence to accomplish e-learning activities and improve their satisfaction. Many studies explore influences of self-efficiency on users’ recognition effects. Wang and Ne wlin (2002) from a research, on 122 students, concluded that students with higher skills are more inclined to adopt a network-based learning system and earn grades, significantly, better than those of low grades. Users’ skills which considered in this study are learners’ ability to evaluate their ability to use the software, hardware, e-mail and Internet to perform an e-Learning activity.

Hypothesis 2. Self-directed ability of learners influences learners’ readiness for an online course.

In an online course, a learner goes through instructional material, delivered via the Web, at his/her own pace with no (more precisely, with minimal) interaction from an instructor. Self-directed of learners is a factor which can be used to measure whether or not a learner can stand alone, when an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001). Piskurich (2003) believes an ability to work alone, whenever an instructor is not available (Haney, 2001).

Hypothesis 3. Learners’ attitude toward an online course influences on their readiness for the course.

Arbaugh (2002), Hong (2002), and Piccoli et al. (2001) are such authors, among other 19
attitude, towards e-learning, are an im portant factor in e-
learning readi ness. Learner’s atti tude can be defi ned as
learner’s impression to part icipate in an e-le arning activ-
ity. In structors post th eir material s on the platform and
learners part icipate through computer net works. A m ore
positive atti tude to ward e-lear ning, for ex ample, whe n
students are not afraid of the com plext y of using com-
puters, will result in more satisfaction and effec tiveness of
learners in an e-learning environment (Piccoli et al.,
2001). Fur thermore, posi tive atti tudes to ward e-learning
increase the chances of success of an e-learning system, while
negative atti tudes reduce it. Therefore, this research
consi ders learners’ atti tude to wards computers as an im-
portant factor in e-learning readiness.

Hypothesis 4. Learner’s computer anxiety influences
on their readiness for an online course.

Piccoli et al. (2001) believe computer anxiety, si gnifi-
cantly, affects an e-learning environment. Computers are
communication tools in an e-learning environment. There-
fore, any fear in com puter usage would certainly hamper
learning (Piccoli et al., 2001). C omputer anxiety is an
emotional fear wh ich co mes up so me pote ntial nega tive
outcomes, such as dam aging to e quipment or look ing
foolish (Barbeite and Weiss, 2004). The higher computer
anxiety causes the lower level of e-learning readiness. The
definition of computer anxiety in this research is the level of
learners’ anxiety, when they apply computers.

Hypothesis 5. Equipments influence on learners’
readiness for an online course.

Other factors contributing to an increase in e-learning
readiness are the infrastructure of technology and tech ni-
cal support of an e-learning system. It is important to
bring into account the reliability and quality of the system,
because they play important roles in e-learning readiness.
To build an acceptable e-learning environment, one has to
maintain and update technology and material represen-
ted by the environment (Folorunso et al., 2006; Poon et
al., 2004; Selim, 2005).

Hypothesis 6. Scholastic success of learners, influ-
ence on learners’ readiness for an online course.

Carmel and Gold (2007) pointed out those learners who
reported a higher readiness ended to be more successful,
scholastically.

Hypothesis 7. Gender of learners influences on learn-
ers’ readiness for an online course.

Summer (1990) and D. M. Mahon and D. G. Adshead (1995)
found that male students experience less anxiety about
ICT than female students. Moreover, Oliver (1993) and D.
Van B. Raak (2001) discovered that female students have
lower confidence or knowledge ability than males regarding
computer usage. However, many other authors (such as
Koohang, 1989; Koo, 1998; Hunt and Bohlin, 1993; Marshall
and Bannon, 1986; Woodrow, 1991 among others) are agree
with the claim that “there are no significant different
between attitude of male and female students regarding ICT
usage”.

Hypothesis 8. Major of learners influences on their
readiness for an online course.

Summers and Easdown (1996) mentioned that student’s
major and specialization are such factors which influence
on e-learning’s readiness.

IV. Research Design

A series of in-depth interviews, with various experienced
in e-learning and instructors of the course, have been
conducted to examine the validity of our research model.
After that, questionnaire items developed based upon pre-
vious literatures and comments gathered from the in-
terviews. Questionnaires were revised with help from experts
(including academic s and practitioners) to ensure significant
experience in e-learning and Probability and Statistics. A
5-point Likert scale ranging from 1, 3 strongly disagree,
to 5, as strongly agrees, is used for the measurement.

A pret est, to measure validity and reliability of the
study, was conducted with 3 instructors and 2 e-learners’ ex-
erts. F ol lowed by pret est to verify reliability of question-
aire, a pilot test has been conducted using 20 randomly
chosen students from the target population. Ques-
tions reg arding sk ills of u sers, on line audio/video, self-
directed learning, learner attitude towards learning, learner
computer anxiety, equipments, and e-learning readiness
can be summarized into 7 single factors

The Cronbach’s alphas from those factors are 80.2%, 75.34%,
89.01%, 89.32%, 73.02%, 89.54%, and 78.93% respectively,
which indicate an acceptable reliability of the ques-
tionnaire.

The research population included all undergraduates stu-
dents in computer and electronic majors, who registered in
the Probability and Statistics course in 2009 winter semes-
ter at SBU (with total population si ze N=130). After a pi lot
survey, a census study was conducted by distributing the
questionnaire among all students. This survey generated
response rate of 83.8%, which is indicated that the respon-
dents found the topic interesting and relevant.

This research used two statistical packages, Minitab 13,
SPSS 16, to analyze the data. Data was analyzed using the
following two techniques.

A. Ordinal Logistic Regression

The binary logistic regression is a well-known tech-
ique to set up a generalized linear model for the binary
dependent variable. Bet for multiple ordinal dependent
variables, the binary logistic regression on does not work
properly. Statisticians develop ordered or multinomial logistic
regression to handle multiple ordinal dependent variables.
Minitab 13 is a statistical software package that can fit an
ordinal logistic regression model to data. The output of the
software includes: (1) Response and Factor Information, which
displays the number of obser-
ations used in the model; (2) Logistic Regression Ta-
ble, which shows the estimated coefficients, p-values (re-
lated to a test that the corresponding coefficient is zero),
and odds ratio (which shows the effect of each variables on
the model); (3) Goodness-of- Fit Tests, which display both
Pearson goodness-of-fit test of the model to data. The
steps in model building for an ordinal logistic model are
similar to those for the binary logistic regression model.
Unfortunately, the f u ll il list of ordinal logistic regression model
available in the software packages. So, one has to choose
a meaningful and appropriate model by entering variables
with significant coefficients (p-value<0.05) and ordering effect
decreasing odds ratio. (negative coefficient along smallest odds ratio indicate more impact of the
variable on the dependent variable, M Cullagh and Nel der, 1992). Finally, appropriative of model is evaluated by (1) a
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TABLE II.
DEMOGRAPHIC PROFILE AND DESCRIPTIVE STATISTICS OF STUDENTS

<table>
<thead>
<tr>
<th>Sex</th>
<th>Female (42.20%)</th>
<th>Male (57.80%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Province</td>
<td>Tehran (77.78%)</td>
<td>Other (22.22)</td>
</tr>
<tr>
<td>Major</td>
<td>Computer (33.03%)</td>
<td>Electronic (66.97%)</td>
</tr>
<tr>
<td>Computer usage (daily)/hour</td>
<td>Mean=3.058 S.D=1.811</td>
<td></td>
</tr>
<tr>
<td>Internet usage (daily)/hour</td>
<td>Mean=2.159 S.D=1.519</td>
<td></td>
</tr>
</tbody>
</table>

B. Contingency table

A contingency table (or cross tabulation) describes the distribution of two or more variables simultaneously. Each cell shows the number of respondents, who gave a specific combination of responses. Since contingency table is easy to understand, can be used with any kind of data, (the contingency tables treat nominal, ordinal, interval, and ratio scales as a nominal scale), provides greater insight than single statistics, and can be used as a tool to measure association among variables is one of most popular techniques in statistics. I n a two-way contingency table, there are several statistical tests can be used to test hypothesis:

\[ H_0 : \text{Row's Variable influences on variable in column, vs. } H_1 : \text{Rejection of } H_0. \]

Which the chi-square test is the most popular one. The small enough p-value of the test (less than 0.05) indicates that there is no evidence for association between these variables.

V. RESULTS AND DISCUSSION

Demographic profile and descriptive statistics of target population are summarized in Table 2.

Table 3 summarizes personal facilities and attitude of students about university facilities.

A. Ordinal Logistic Regression

As mentioned the above, several 5-point Likert scale variables have been used to measure readiness of a learner (see Appendix A). To summarize such variables into a single one, say the dependent variable, one has to use the median, which is an appropriate central tendency for Likert scale variables, see Agresti, 2003 and Johnson at al, 1999, among others. Therefore, readiness of each learner has 9 levels, because median of those 5-point Likert scale variables generates 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, and 5.

To discover a extent of independent variables the dependent variable an ordinal logistic regression on can be employed. The following table represents coefficients, p-values and odds ratios of such ordinal logistic regression.

Results of Table 4 (below) can be summarized as the following:

1. There is significant evidence to conclude that skills of users (e-mail skills), sk ills of users (software ability), sk ills of users (internet skills), self-directed learning, and learner atttitude to ward e-learning are such variables whose affect readiness, the dependent variable (their p-values is smaller than 0.05).
2. Small odds ratio indicates that impact of significant factors can be or dered as (1) sk ills of users (Internet sk ills), (2) self-di rected learning, (3) learner attitude toward e-learning, (4) sk ills of us ers (e-mail skills), and (5) sk ills of users (software ability).
3. P-value=0.00 for test th at “all coefficients are zero” al on g with the p-value=0.899 for “the Goodness-of-Fit Test s” indicate that the ordinal logistic regression is an appropriate model to analyze the data.
4. The ordinal logistic regression on gives 8 parallel equations \( i=1,2,\ldots,8 \)

\[ \gamma_i = \exp(\alpha_1 x_i - 3.212 x_i^2 - 0.232 x_i^3 - 1.23 x_i^4 + 2.330 x_i) \]

where \( \gamma_i \) is the cumulative probability of the dependent variable and \( \alpha_1, \alpha_2, \ldots, \alpha_8 \) are constant values, which given in Table 5.
TABLE IV. 
ORDINAL LOGISTIC REGRESSION

<table>
<thead>
<tr>
<th>Dependent variable, i.e., efficiency of the model.</th>
<th>Coefficient</th>
<th>P-value</th>
<th>Odds ratio</th>
<th>Rank order</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_1 )</td>
<td>0.842 0.</td>
<td>0.042</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>1.805 0.</td>
<td>0.000</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_3 )</td>
<td>0.345 0.</td>
<td>0.001</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_4 )</td>
<td>0.352 0.</td>
<td>0.000</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_5 )</td>
<td>0.452 0.</td>
<td>0.000</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_6 )</td>
<td>2.452 0.</td>
<td>0.005</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_7 )</td>
<td>3.452 0.</td>
<td>0.021</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>( \alpha_8 )</td>
<td>4.320 0.</td>
<td>0.000</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>Skills of users (e-mail skills), say ( X_5 )</td>
<td>-2.330 0.</td>
<td>0.040</td>
<td>1.3335</td>
<td>5</td>
</tr>
<tr>
<td>Skills of users (hardware ability)</td>
<td>-0.321</td>
<td>0.091</td>
<td>0.211</td>
<td>-</td>
</tr>
<tr>
<td>Skills of users (software ability), say ( X_4 )</td>
<td>-1.232 0.</td>
<td>0.000</td>
<td>1.321</td>
<td>4</td>
</tr>
<tr>
<td>Skills of users (Internet skills), say ( X_1 )</td>
<td>-3.212 0.</td>
<td>0.003</td>
<td>0.210</td>
<td>1</td>
</tr>
<tr>
<td>Self-directed learning, say ( X_2 )</td>
<td>-3.321 0.</td>
<td>0.000</td>
<td>0.321</td>
<td>2</td>
</tr>
<tr>
<td>Learner attitude toward e-learning, say ( X_3 )</td>
<td>-0.232 0.</td>
<td>0.001</td>
<td>0.983</td>
<td>3</td>
</tr>
<tr>
<td>Learner computer anxiety</td>
<td>-0.302</td>
<td>0.230</td>
<td>0.442</td>
<td>-</td>
</tr>
<tr>
<td>Equipments (hardware)</td>
<td>-2.123</td>
<td>0.410</td>
<td>0.662</td>
<td>-</td>
</tr>
<tr>
<td>Equipments (software)</td>
<td>-0.091</td>
<td>0.621</td>
<td>0.421</td>
<td>-</td>
</tr>
<tr>
<td>Equipments (Internet)</td>
<td>-0.001</td>
<td>0.832</td>
<td>0.321</td>
<td>-</td>
</tr>
<tr>
<td>Online audio video</td>
<td>-0.129</td>
<td>0.785</td>
<td>3.211</td>
<td>-</td>
</tr>
</tbody>
</table>

p-value of goodness-of-fit test= 0.899
p-value of test that “all coefficients are zero”= 0.002

TABLE V. 
HYPOTHESIS’S RESULT

<table>
<thead>
<tr>
<th>Hypothesis number</th>
<th>Chi-square statistic</th>
<th>Degree of freedom</th>
<th>p-value</th>
<th>Result on ( H_0 ) at significant level ( \alpha = 0.05 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 13.114</td>
<td>8</td>
<td>0.892</td>
<td>Accepted</td>
<td></td>
</tr>
<tr>
<td>2 4.893</td>
<td>8</td>
<td>0.231</td>
<td>Accepted</td>
<td></td>
</tr>
<tr>
<td>3 9.817</td>
<td>16</td>
<td>0.124</td>
<td>Accepted</td>
<td></td>
</tr>
<tr>
<td>4 3.114</td>
<td>942</td>
<td>0.001</td>
<td>Rejected</td>
<td></td>
</tr>
<tr>
<td>5 0.</td>
<td>464</td>
<td>0.000</td>
<td>Rejected</td>
<td></td>
</tr>
<tr>
<td>6 3.515</td>
<td>8</td>
<td>0.102</td>
<td>Accepted</td>
<td></td>
</tr>
<tr>
<td>7 1.</td>
<td>596</td>
<td>0.009</td>
<td>Rejected</td>
<td></td>
</tr>
<tr>
<td>8 17.435</td>
<td>16</td>
<td>0.642</td>
<td>Accepted</td>
<td></td>
</tr>
</tbody>
</table>

B. Hypothesis tests:

As pointed out the above, readiness of each learners is a 9 level variable to test the given hypotheses, one has to categorize the second variable in each hypotheses into some levels. Population can be categorized into some groups regarding skills (low and high), self-directed ability (low and high), learners’ attitude toward the online course (negative, neutral, and positive), learners’ computer anxiety (negative, neutral, and positive), ICT’s equipment (enough and lack), gender (male and female), major (computer sciences and Electronic), and scholastic success according to their GPA (week, GPA<12, average, 12 ≤ GPA<17, and strong, GPA ≥ 17). The contingency analysis has been con
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Figure 1. Discriminative index to identify level of readiness of each individual

Figure 2. Distribution of the target population regarding level of readiness.

ducted to see the given hypotheses. Results summarized in Table 4.

From Table 4, one can observe that:
1. Computer anxiety, equipment, and gender of students do not affect their readiness reading the online training system.
2. Skills, self-directed ability, attitude toward the online training system, scholastic, and major of students affect their readiness reading the training system.

In order to help managers of universities, we introduce a discriminative index to identify level of readiness of each individual. Figure 2 duplicates such index.

The bar chart above duplicates level of readiness of the target population, regarding the above discriminative index.

Using the discriminative index, provided by Figure 2, one can observe that, more than 80% of the target population is ready for the online course and consequently for the hybrid course. But, they need some improvements, which vary from an individual to another one.

VI. CONCLUSION AND SUGGESTION

This study made theoretical and practical contributions to the literature of the hybrid course readiness and more specifically on students’ perceptions of the hybrid course implementation at SBU. The empirical results showed that the most of factors that were extracted from the data were genuinely significant in predicting the criterion variable. Our findings could have practical importance for any university as whose planning to implement such hybrid courses. Universities, in their rush to implement the hybrid courses often place too much emphasis on the equipment and too little on the human part. So, this research comes up with authorizes must take a hard look at skills of users (Internet skills), self-directed learning, learner attitude toward e-learning, skills of users (e-mail skills), and skills of users (soft ware ability) even though other non-significant, statistically, factor should be taken in to account to have efficient and successful hybrid training system.

This study was the first part of a long term project, which designation and implementation of the hybrid course and study satisfaction and follow-up study are the last part of such project. Already, the second part of the project has been started. The Online part of the hybrid course available at: http://faculties.sbu.ac.ir/~payandeh/efront/www/index.php?logout=true, where students in summer semester, in 2009, used it to write quizzes, download and upload assignments, and review the course materials.

To design the website, we use an open source Web designer named Efront. Efront provides ability to the Web administrator to orient e-learners’ activities by (i) defining some rules for e-learners; (ii) providing a complete database about activities of e-learners on the webpage; (iii) ability to assign, randomly, a quizzes to learners. Other Efront’s abilities may be found in Zaharia (2007) and its official website available at http://www.epignosis.com.gr/.

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APPENDIX A. QUESTIONNAIRE ITEMS AND SOURCES

<table>
<thead>
<tr>
<th>Independent variables</th>
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<td>How confident do you feel about:</td>
<td>Nakhoda et al (2006), SORT website</td>
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<td>1. Logging in and out of your account?</td>
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## Self-directed learning
Are you able to:

1. Learn without assistance of instructors?
2. Resist distractions and stay on task while working or studying?
3. Keep up with your assignments, and meet deadlines?
4. Manage your time appropriately?
5. Complete things on time?


## Learner attitude toward e-learning
I believe that e-learning:

1. is very difficult (R)
2. is very complicated (R)
3. requires technical ability (R)
4. let me feel psychological stress very greatly (R)
5. can be done only if one knows a programming language such as Basic (R)
6. is only advisable for people with a lot of patience (R)
7. makes a person more productive at his/her job (R)
8. is for young people only (R)

(Likert’s scale 1, strongly disagree; 5, strongly agree)

Gattiker and Hlavka (1992)

## Learner computer anxiety
I think:

1. Working with a computer would make me very nervous
2. I get a sinking feeling when I think of trying to use a computer
3. Computers make me feel uncomfortable
4. Computers make me feel uneasy and confused

(Likert’s scale 1, strongly disagree; 5, strongly agree)

Barbeite and Weiss (2004)

## Equipments
Do you have:

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<th>Software</th>
<th>Internet</th>
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<td>1. A consistent and convenient access to a computer?</td>
<td>1. Do you have:</td>
<td>1. Do you have:</td>
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<td>2. A sound phones or speakers and microphone?</td>
<td>2. A Web browser, such as safari, fire-fox, Internet explorer, on your computer?</td>
<td>2. A reliable Internet connection?</td>
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<tr>
<td>6. A laptop?</td>
<td></td>
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## Dependent variables
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<td>2. My parents are ready to support the use of e-learning at home.</td>
<td></td>
<td>So and Swatman (2007)</td>
</tr>
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<td>3. I think I am ready for e-learning</td>
<td></td>
<td>And self-development</td>
</tr>
<tr>
<td>7. I think I am ready to take my quizzes, assignments, extra examples from the web.</td>
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</tr>
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<td>8. I think I am ready to communicate with instructors and students via the web.</td>
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<td>4. I think it is the right time to promote e-learning in universities</td>
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<tr>
<td>5. Taking this class in this manner allows me to arrange my work for the class more effectively.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The advantages of taking this class in this manner outweigh any disadvantages</td>
<td></td>
<td></td>
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<td>7. Taking this class in this manner allows me to see course lectures which I was absent in that lessons</td>
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http://www.i-jet.org