Evaluating and improving educational material and

tutoring aspects of Distance Learning Systems

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Abstract

This paper presents the approach followed for the evaluation of the educational system of the Informatics Course in the Hellenic Open University. Emphasis is placed on the evaluation method itself, which is general enough to be applied in similar evaluation cases, and on the discussion of the lessons learned during this evaluation. The presented method can be used for the improvement of the two major components of distance learning systems: the educational material and the role of the tutor. The paper discusses the conclusions drawn from the evaluation procedure and the actions taken towards improvement, aiming to serve as an example for similar attempts and share experiences in the field of distance education.

Evaluating and improving educational material and tutoring aspects, the two major components of Distance Learning Systems.

Introduction

The evaluation of an educational system can be defined as a systematic procedure of collection and interpretation of data, concerning particular components of the system according to specific criteria and aiming at the feedback of these activities and efforts with useful information (Chinapah, & Miron, 1990; Calder, 1995).

The educational staff and the educational material are the most important factors that contribute to the success of every educational effort (Filipczak, 1995). Therefore, the feedback gained from their evaluation is of great importance. In the literature there are a number of articles related to studies of evaluation systems most of which deal with traditional teacher-oriented education (Husbands, & Fosh, 1993; Pletinckx, & Segers, 2001).

Nowadays, an increasing number of higher education institutes and universities, other than Open Universities, offer courses using the distance education approach. The role of a distance-learning course tutor is very important. He/she has to teach, evaluate and continuously support his/her students despite the distance between him/her and them. The communication with the students by post, telephone, e-mail, through the written assignments or at optional consulting meetings helps the tutor to respond to this complex role. In any case, the tutor should promptly solve students' educational problems, discuss in a friendly way the issues that distract them, instruct them during their studies, but most of all encourage them to continue their studies, understanding their difficulties and effectively supporting them (Kasworn, 1983; Naidu, 1994; Race, 1993, Rowntree, 1998; Barnard, Veldhuis, & C.G.M. van Rooij, 2001).

Distance learning specific educational material contributes remarkably to the success of similar educational systems and consequently it should satisfy specific demands and be characterized by specific features. In order to respond to these demands, the educational material has to promote the interaction between student and educational context, to explain difficult meanings, to give students the ability to evaluate themselves and keep track of their progress, as well as to encourage them with appropriate feedback in every exercise and activity. The educational material should be planned and developed in order to

be able to give the opportunity to the students to define the place, the time and the pace of their study, serving in that way the aspiration of Distance Learning (Rowntree, 1997).

However, it is a fact that every time a course is offered, different results may be obtained according to specific factors that influence the whole procedure. In any case, some 'specific' factors such as individual student characteristics should not be underestimated. Most of the students of a Distance Learning course do not have previous experience in distance learning methods; they are more familiar with the teacher and the textbooks of the traditional high-school education. Even less are they familiar with the changing roles between tutor and students, or with the 'specific' educational material used in distance learning.

All the above mentioned parameters make the evaluation of a distant educational effort a necessity and the results derived very important. During an assessment, data from different sources should be collected. During an evaluation of a distance-learning course, data derived from students, tutors, administrative managers, book authors, distance learning experts, academic teachers and counselors should be compared and interconnected with each other. In our study, students along with the tutors are the main sources because they are the main users of the course components and at the same time the receivers of every educational gain. In any case, the evaluation procedure should be based on well pre-determined criteria in order to offer useful feedback to those who design and those who develop. Only under this condition it will be made possible to improve the educational procedure, increase and improve the effectiveness of the educational content and maximize the educational suitability of the course (Chinapah, & Miron, 1990; Calder, 1995).

The evaluation procedure described in this paper is based on the concept of the Goal-Question-Metric (GQM) method (Basili, Caldiera, & Rombach, 1994). This is a method commonly used for quality improvement in software development. The basic idea of the method is to help towards improvement by collecting data that aid in achieving goals of quality. Such 'goal-oriented measurements' are especially used for software improvement and can also be successfully applicable in the evaluation of educational packages, procedures and methodologies (Barnard, Veldhuis, & C.G.M. van Rooij, 2001).

The GQM Method and the Hellenic Open University Case

It is a common fact that the evaluation of an educational effort should be a continuous procedure including constant improvement and revisions of the components of the system under evaluation according to the results derived. It is also a common fact that it is very difficult to evaluate all the components of a system during a single assessment, so it is of great importance to define primarily the aim of the specific evaluation.

The present study is a starting point in an effort to achieve goals of internal quality assurance in the course of Informatics in order to improve the quality and the effectiveness of the educational services offered. This paper focuses on the evaluation of the suitability of the educational material used during the module 'Introduction to Informatics' in the 'Informatics' course at the Hellenic Open University and the effectiveness of the tutorial aspects.

The aforementioned GQM method was used to organize the authors' efforts towards continuous improvement. The GQM methodology was adopted in order to achieve a well-defined and standardized evaluation procedure with discrete phases aiding towards the provision of reliable and valid results that could lead to an effective feedback. This formulation could be the starting point for optimizing the quality of the education offered, the curriculum context and the staff performance.

The GQM method is composed of four phases (Solingen, & Berghout, 1999) as these can be depicted in figure 1:

1) The *planning phase*, during which the measurement is selected, defined and planned.
2) The *definition phase*, during which the measurement procedure is defined (goals, questions, metrics) and documented.
3) The *data collection phase*, during which actual data collection takes place.
4) The *interpretation phase*, during which collected data are processed into measurement results that provide answers to the defined questions, after which goal attainment can be evaluated.
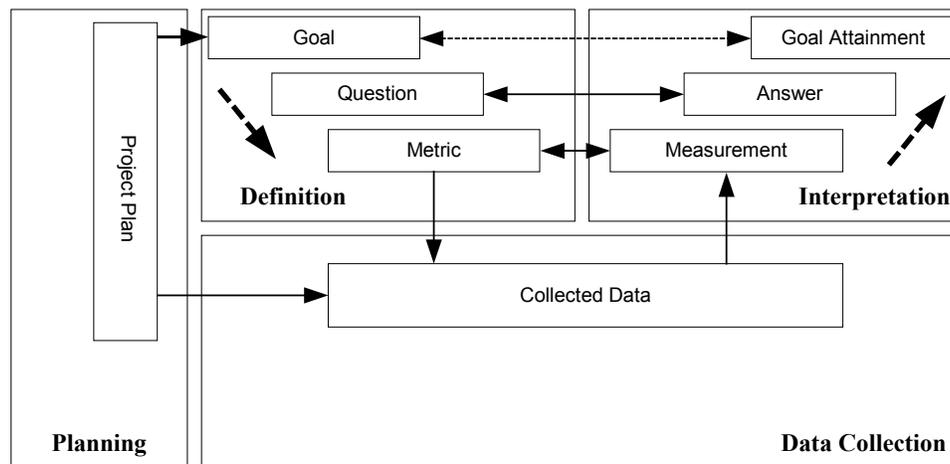

Figure 1: GQM phases

The Planning Phase

The number of students in the Course of Informatics who registered to study in the Academic year 2000-2001 was 510. During the 1st year of studies the students are advised to include INF10 'Introduction to Informatics' in their selected modules. Thus, 97.7% (498 students) of them decided to attend the INF10 module. This vast attendance provides a very representative sample for this survey.

The educational material of the module 'Introduction to Informatics' consists of 4 volumes: 'Introduction to Informatics' (an introductory volume), 'Introduction to Software Engineering' (a volume concerning programming techniques), 'Data Structures' and 'Programming Languages'. A printed study-guide is given to the students to accompany the four books and instruct their study.

There are 15 tutors engaged in the module. Each tutor is responsible for 30 students approximately. During the academic year, students have to hand in 6 written assignments, participate in 4 optional face to face meetings with their tutor and sit for final examinations after an 11-month-period. Tutors have to continuously support their students, give them marks, comments and advice on the written assignments, and organize the face-to-face consulting meetings. Additionally, tutors ought to specify predetermined hours on a weekly basis when their students can communicate with them, in order to discuss educational issues and queries on the educational material and the written assignments.

This effort focuses onto two major components that needed to be measured in order to initiate actions towards improvement: the role of the tutor and the educational material.

The Definition Phase

The survey was based on two printed self-report questionnaires that were handed out to the students and tutors to fill in. The questions that were included in both questionnaire formulations were chosen for optimal comparison with each other.

Each questionnaire included fixed choice questions (with ordinal and nominal answers) and open-ended questions. As far as open-ended questions are concerned, a content analysis was performed to categorize both students' and tutors' answers.

The students' questionnaire consisted of 47 questions of which 9 were open-ended and 38 close-ended questions (6 dichotomical and 32 ordinal ones). As far as the tutors' questionnaire is concerned it consisted of 45 questions of which 14 were open-ended and 31 close-ended questions (3 dichotomical and 28 ordinal ones). The average time needed for the completion of the questionnaires for both students and tutors was approximately 20 minutes.

Factors concerning the individual characteristics of the students and the tutors were also taken into consideration because they influence the results of

the evaluation. Such factors were sex, age, family status, occupation, previous education and experience concerning the specific studies and available time for study for the students. Regarding tutors, their factors were sex, age, family status, occupation, previous teaching experience and studies in the field of Open and Distance Learning (ODL).

The scales used to measure the above mentioned criteria in the questionnaires were mainly ordinal scales such as the five point Likert scale (1=totally disagree; 2=rather disagree; 3=neutral; 4=rather agree; 5=totally agree or 1=not satisfied; 2=a little satisfied; 3=moderately satisfied; 4=satisfied; 5=very satisfied or 1=not useful; 2=less useful; 3=moderately useful; 4=useful; 5=very useful), and the Yes/No scale. Finally, open-typed questions were used to complete some questions such as: describe, explain or suggest.

In order to achieve the aims of the study and the goals of the present evaluation, specific criteria for the educational material and the tutors were defined and used to formulate the above-mentioned questionnaires.

The criteria used for the evaluation of the tutoring aspects are:
- A. The encouragement and the support to the students (question example: *Does your tutor support and encourage you during your studies?*)
- B. The type and the quality of the communication with the students (question example: *Are you satisfied with the communication with your tutor / your students?*)
- C. The quality and the effectiveness of communication during face to face optional meetings (counseling meetings) (question example: *Are you satisfied with the communication with your tutor / your students during face to face meetings?*)
- D. The way of evaluating and commenting the written assignments (question example: *the usefulness of the comments on the written assignments*)
- E. The general impression and satisfaction from tutors' educational efforts (*the results to this criterion are derived from the combination of the answers to a number of relative questions*)

The criteria used for the evaluation of the educational material are:
- A. Comprehensibility of the context and cohesion of the concepts (question example: *is the context of the four volumes comprehensive?*)
- B. Instigation of student's initiative and interactivity with the learning process (question example: *does the context of the four volumes instigate you to study additional literature?*)
- C. Difficulties while studying the educational material (question example: *are there chapters in the four volumes that are difficult for you to understand? Specify*)
- D. Effectiveness of the exercises (activities and self-assessment exercises) (question example: *are the exercises in the four volumes in cohesion with the learning objectives?*)

E. Useful and satisfactory feedback from the exercises (activities and self-assessment exercises) (question example: *are the answers of every exercise in the four volumes satisfyingly explanatory?*)

F. Students' guidance concerning their study (realistic study schedule and informative structure) (question example: *is the time schedule for every part of the material (for studying a chapter or for solving exercises or for conducting a written assignment) realistic; does it guide you satisfyingly during your studies?*)

Each one of the above-mentioned criteria was analyzed into suitable questions (see some examples above) in order to extract answers from both students and tutors to identify and interpret discrepancies (if any) between their judgments and aspects.

The Data Collection Phase

This study was focused on those students who had handed in at least 5 of the 6 obligatory written assignments and had participated in at least 3 out of 4 face to face optional counseling meetings (inclusion criteria). Thus, the total number of the students that could participate into this study was 303 of a total of 498 students who attended the module 'Introduction to Informatics'.

All of them were analytically informed about the way in which studies in the Hellenic Open University are organized and they had already studied in this system for at least 8 months. These students had received their tutor's comments on their written assignments as well as the necessary advisory letters. They had repeatedly communicated with their tutor and the administrative services of the Hellenic Open University and they had already studied the four volumes of the educational material. These students were called to answer the questionnaire and to suggest improvements concerning the activities mentioned above. The questionnaire was given to the students during the fourth face-to-face meeting or it was sent by post and collected after the final examinations.

All tutors involved in the module 'Introduction to Informatics' took part in this study. The questionnaire for the tutors was sent to all of them during the examination period by email or by post.

The Interpretation Phase

The data were collected on the basis of a descriptive research design. The type of data distribution was examined for all data and analyzed using multivariate methods (Anastasi, & Urbina, 1997). The main statistical tests used to test the differences between questions and criteria (variables) and to detect the possibility of correlation between them were x^2-test, analysis of variance (ANOVA), Students' t-test and Spearman's rank order correlation coefficient. The resulting correlations and differences between variables were considered as statistically significant when $p<0,05$ (Siegel, & Castellan, 1988; Anastasi, & Urbina, 1997) otherwise they were assumed non significant (NS).

Sample Description

Students

The total number of the students who met the inclusion criteria to enter this study was 303. Finally, 249 students (study sample) completed the given questionnaires and therefore participated in this study. The average age was $31,2 \pm 4,5$ years with minimum age of 24 years and maximum of 47 years. Our sample consisted of 172 men (69,1%) and 77 women (30,9%).

More than half the students who participated in this study (137 students - 55,0%) were married. From the group of the married ones 19,0% had 1 child, 21,2% had 2 children and 2,9% had 3 children.

Most of the students who have taken part in our study work and at the same time study at the Hellenic Open University (191 students - 76,7%). 189 students (75,9%) stated that they have already received some education in computers after high school (Figure 2). The occupation of a high percentage (198 students, percentage 79,5%) of the students was related to computers. Some of them simply use computers in their work (e.g. use of word processors) -defined as 'partly'-, but for some others Informatics was the main subject of their job -defined as 'completely'- (e.g. teaching Informatics, programming etc) (Figure 3).
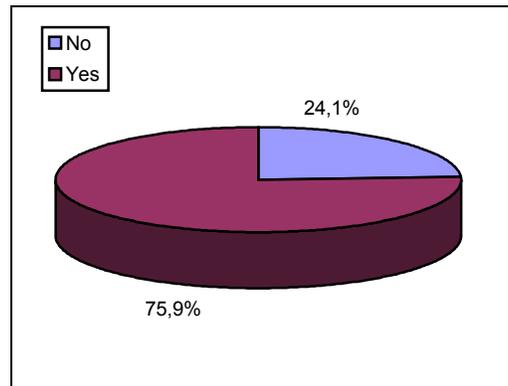
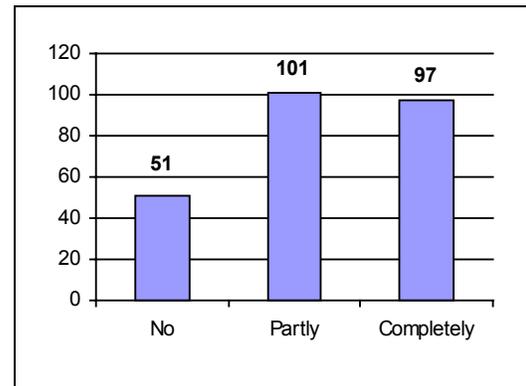|	
Figure 2: Have you ever followed a computer-related educational course?	Figure 3: Does your profession involve the use of computers?

Tutors

All 15 tutors participated in our study. Their average age was $39,2 \pm 7,7$ years with a minimum age of 29 years and a maximum of 54 years. The tutors' sample consisted of 14 males (93,3%) and 1 female (6,7%).

All of them were Ph.D. holders in Computer Science or Informatics and had received training in distance learning methodology. Six of them had completed postgraduate studies in ODL and all the others have attended

seminars of the same subject. The average time of previous university level teaching experience was $8,2 \pm 7,8$ years.

Results

Data analysis and processing using the above mentioned statistical tests gave the following results and showed significant correlation between major factors that have been under consideration during the current assessment.

The Role of the Tutor – Tutoring aspects

Tutors' encouragement and support was defined as very satisfying according to the majority of students which was 'adequately' and 'more than adequately' satisfied (88,0%) (Table 1).

Does your tutor support and encourage you during your studies?	f	rf%
Not at all	5	2,0
Not enough	3	1,2
Enough	22	8,8
Adequately	65	26,1
More than adequately	154	61,9
Total	**249**	**100,0**

Table 1: Does your tutor support and encourage you during your studies?

Tutors support and encourage their students in every communication with them, during face-to-face consulting meetings, by commenting students' written assignments or by means of telephone, post or email communication. The most preferable mean of communication between tutors and students was e-mail according to the opinion of 222 students (89,2%) and all tutors.

The majority of both students (85,6%) and tutors (80,0%) stated that they were 'satisfied' and 'very satisfied' with the communication established (Tables 2, 3).

Are you satisfied with the communication with your tutor?	f	rf%
Not satisfied	3	1,2
A little satisfied	7	2,9
Moderately satisfied	25	10,3
Satisfied	81	33,5
Very satisfied	126	52,1
Total	**242**	**100,0**

Are you satisfied with the communication with your students?	f	rf%
Not satisfied	0	0,0
A little satisfied	0	0,0
Moderately satisfied	3	20,0
Satisfied	9	60,0
Very satisfied	3	20,0
Total	**15**	**100,0**

Table 2: Are you satisfied with the communication with your tutor?

Table 3: Are you satisfied with the communication with your students?

There are no statistically significant differences between tutors' and students' opinions concerning communication between them by all means used. Both students and tutors asked for more frequent communication (55,8% of the students and 46,7% of the tutors). This request was independent of the students' sex, age, previous education in computers and the use of computers at their jobs.

Additionally, tutors emphasized in the quality of the communication with their students. Tutors stated that usually most of their time was spent on questions concerning procedural and administrative topics instead of using this time to answer questions on the educational material, the written assignments and discussing difficult to understand parts of the material.

The majority of the students (83,6%) considered the comments on their written assignments as 'very useful' (108 students - 43,4%) or 'useful' (100 students - 40,2%). 'Useful' and 'very useful' was also the estimation of the majority of the tutors concerning the usefulness of the comments on the written assignments.

33,3% of the students was 'satisfied' and 43,8% were 'very satisfied' with the contact and the communication with their tutors during face-to-face meetings.

A need for additional face-to-face consulting meetings was requested by the majority of both students (179 students - 71,9%) and tutors (12 tutors - 80,0%).

By combining questions concerning criteria of student satisfaction from the communication with the tutors, the encouragement and support by them as well as criteria such as satisfaction from face to face meetings and interpretation of students' written assignments, a new variable (item) was derived. It is called 'students overall opinion for the tutors' and a five-grade evaluation scale was used to rate it. The results of this variable are presented in Table 4.

Students overall opinion for the tutors	f	rf%
1 – Poor	5	2,0
2 – Less than moderate	11	4,4
3 – Moderate	46	18,5
4 – Good	122	49,0
5 – Excellent	65	26,1
Total	**249**	**100,0**

Table 4: Students' opinion for their tutors

The total estimation of the students concerning their tutors (according to the five-grade scale) proves high levels of satisfaction concerning the supplied tutoring services (average score $4,27 \pm 0,78$). The high-grade evaluation concerning tutoring services was independent of the students' sex (t=0,04, NS) and students' previous education in computers (t=-0,08, NS), but it seemed to

be related (even though not strongly) with students' age. It seemed that older students were more satisfied with tutoring services than the younger ones (R=0,19, p<0,01). On the contrary, it was pointed out that students whose profession is related to computers (partly or completely) were significantly more satisfied with the tutoring services offered than those whose jobs were not related with computers (t=-4,85, p<0,01).

Finally, the workload related to the obligatory six written assignments was considered very excessive by the majority of tutors (11 tutors - 73,3%) and a number of students (95 students - 38,2%) (Tables 5, 6).

Workload related to written assignments (students)	f	rf%
Less that needed	13	5,2
Enough	141	56,6
More than needed	95	38,2
Total	**249**	**100,0**

Workload related to written assignments (tutors)	f	rf%
Less that needed	0	0,0
Enough	4	26,7
More than needed	11	73,3
Total	**15**	**100,0**

Table 5: What is your opinion on the workload related to the written assignments?

Table 6: What is your opinion on the workload related to the written assignments?

Educational Material

In contrast with the students' rates for the tutoring aspects, the evaluation of the educational material was poorer. More than half of the students faced 'some' difficulties (155 students - 62,2%) and 53 students (21,3%) faced 'a lot of' difficulties studying the educational material (Table 7).

The issue of 'difficulties' during studying the educational material is 'vague' and 'complex' and depends on the nature of the educational material and its components. Thus, students' and tutors' opinion on this issue was derived by combining the answers to a number of relevant questions.

The same opinion was marked out by the tutors who believed that their students faced difficulties studying the educational material (Table 8).

Difficulties studying the educational material (students)	f	rf%
No	41	16,5
Yes, some	155	62,2
Yes, many	53	21,3
Total	**249**	**100,0**

Difficulties studying the educational material (tutors)	f	rf%
No	0	0,0
Yes, some	14	93,3
Yes, many	1	6,7
Total	**15**	**100,0**

Table 7: Do you have any difficulties studying the educational material?

Table 8: Do your students have any difficulties studying the educational material?

The combination of questions for the educational material concerning criteria such as the comprehensibility of the context, the instigation of students' interactivity with the learning process, the effectiveness of the exercises (activities and self-assessment exercises), the clearness and the importance of the objectives in every chapter, created a new variable. This variable was called 'overall estimation on the educational material' and a five-grade evaluation scale was also used to rate this variable.

More than half of the students (53,8%) and the majority of the tutors (80,0%) evaluated the educational material as 'moderate' (Tables 9, 10).

Overall estimation on the educational material (students)	f	rf%
1 – Poor	2	0,8
2 – Less than moderate	64	25,7
3 – Moderate	134	53,8
4 – Good	47	18,9
5 – Excellent	2	0,8
Total	**242**	**100,0**

Table 9: Overall estimation on the educational material used (students)

Overall estimation on the educational material (tutors)	f	rf%
1 – Poor	0	0,0
2 – Less than moderate	1	6,7
3 – Moderate	12	80,0
4 – Good	2	13,3
5 – Excellent	0	0,0
Total	**15**	**100,0**

Table 10: Overall estimation on the educational material used (tutors)

The total score for the educational material according to the students' overall estimation was $3,44 \pm 0,64$ and according to the tutors' $3,51 \pm 0,45$ (Tables 11,12) proving medium levels of valuation. The differences between students' and tutors' estimation were not statistically significant (t=0,67, NS). Students and tutors gave almost the same scores for each one of the 4 volumes, as shown in Tables 11,12.

Average score of the educational material	mean value	standard deviation
1st volume	3,39	0,75
2nd volume	3,49	0,73
3rd volume	3,34	0,83
4th volume	3,53	0,83
All material	**3,44**	**0,64**

Table 11: Average score for the educational material used (students' opinion)

Average score of the educational material	mean value	standard deviation
1st volume	2,92	0,68
2nd volume	3,76	0,51
3rd volume	3,83	0,61
4th volume	3,52	0,31
All material	**3,51**	**0,45**

Table 12: Average score for the educational material used (tutors' opinion)

Testing the correlation between the overall estimation of the educational material and the previous education on computers, as well as the use of computers in the students' jobs, showed statistically significant results. Thus, students with no previous education in computers gave lower scores (t=-2,45, p<0,05); so did students whose occupation was not related with computers (t=-

2,31, p<0,05). This may be due to the fact that students with no previous education, who at the same time do not use computers at their jobs, have much higher expectations from the education material.

On the other hand, tutors with less teaching experience evaluated the educational material with lower grades than those with long teaching experience (R=0,57, p<0,05). This may be due to the fact that tutors with less teaching experience (usually the younger ones) wish to have the perfect educational material to use.

By grouping suggestions proposed for the improvement of the educational material it can be deduced that 161 students (64,6%) asked for printed supporting educational material concerning some difficult to understand topics in each volume. They also asked for several examples and case reports on difficult topics in order to better understand their practical use and their applications (144 students - 57,8%).

Furthermore, tutors emphasized on the necessity of grouping the frequent questions asked by the students and publishing them on the web site of the module so that the students can find the answers easily.

Discussion

This study aimed at presenting a method for evaluating the educational procedure and improving basic elements of distance education. It also aimed at describing the application of this method in the Course of Informatics, School of Science and Technology of the Hellenic Open University.

The short-term results derived from this first year evaluation pointed out most of the weak points that were taken into consideration for the improvement of the next year module. Particular care has been taken concerning the frequency and the quality of the communication between tutors and students, as this is the main factor affecting students' motivation.

The conclusion that can be drawn from the presented case is that problems with the educational material can be overcome only by enhancing student-tutor communication and by improving communication means and frequency of communication. Tutors gained important feedback concerning mostly students whose occupation is not related to computers and students with no previous education in computers, who need more support and encouragement during the module.

What was also drawn from the evaluation is that students tend to overestimate the role of their tutor in cases of problems with the educational material. In such cases, limited encouragement from the tutor's part could lead to student dissatisfaction, while continuous encouragement may lead to overestimation of tutor performance. Thus, only if the students consider the educational material satisfactory, will the evaluation of the tutor be accurate.

The interpretation of the results and the discussion related to the students' and tutors' data could turn out to be useful, especially if compared with similar

data from other surveys that universities or institutes offering distance education may wish to conduct following this method.

It must be pointed out that the presented case is of a dynamic nature and it cannot be considered as concluded due to the constantly changing environment of computer education, the increasing demand for quality in distance education and the new goals that are defined every year. Emanating from the presented method, we can be led to a continuous improvement process in which every year's results will define the following year's goals.

The availability of an evaluation database makes it possible to carry out quality research. In the near future we will have more insight in the effects of educational elements on learning, on teaching and on student outcomes within the curriculum. Follow-up of the actions undertaken on the basis of the results of the specific evaluation indicates to what extent evaluation really leads to long-term curriculum improvement.

In conclusion, this goal-oriented evaluation has been found to be a good starting point for the faculty to gather useful information and feedback concerning all the major components of the course using a realistic and well-standardized procedure. The proposed method could be a powerful tool for course developers, tutors, authors and distance teaching managers that would support them in taking decisions towards improvement and development. The presented method is generic enough to be applicable in many distance education cases and can be utilized by most universities and institutions offering distance education.

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References

Anastasi, A., & Urbina, S. (1997), *Psychological testing. Ed. (7th)*. Prentice Hall, New Jersey.

Barnard, Y., Veldhuis, G., & C.G.M. van Rooij, J. (2001), Evaluation in practice: identifying factors for improving transfer of training in technical domains. *Studies in Educational Evaluation*, 27, 269-290.

Basili, V.R., Caldiera, C., & Rombach, H.D. (1994). *Goal Question Metric Paradigm*. Encyclopedia of Software Engineering, Vol. 1, John Wiley & Sons, 528-532.

Calder, J. (1995). *Program evaluation and quality: a comprehensive guide to setting up an evaluation system*. Institute of Educational Technology, Open University, Kogan Page, London.

Chinapah, U., & Miron, G. (1990). Evaluating educational programs and projects: holistic and practical considerations. *Socio-economic Studies*, 15, UNESCO, Paris.

Filipczak, B. (1995). Putting the Learning into Distance Learning. *Training*, 32 (10), 111-118.

Husbands, C.T., & Fosh, P. (1993). Students' evaluation of teaching in higher education: Experiences from four European countries and some implications of the practice (I). *Assessment & Evaluation in Higher Education*, 18 (2), 95-114.

Kasworm, C. (1983). Self-Directed Learning and Lifespan Development. *International Journal of Lifelong Education*, 2 (1), 29-46.

Naidu, S. (1994). Applying Learning and Instructional Strategies in Open and Distance Learning. *Distance Education*, 15 (1), 23-41.

Pletinckx, J., & Segers, M. (2001). Programme evaluation as an instrument for quality - assurance in a student-oriented educational system. *Studies in Educational Evaluation*, 27, 355-372.

Race, P. (1993). *The Open Learning Handbook*. Kogan Page, London.

Rowntree, D. (1997). *Preparing Materials for Open Distance and Flexible Learning. An Action Guide for Teachers and Trainers*. Institute of Educational Technology, Open University, Kogan Page, London.

Rowntree, D. (1998). *Exploring Open and Distance Learning. Institute of Educational Technology*. Open University, Kogan Page, London.

Siegel, S., & Castellan, N.J. (1988). *Measures of Association and Their Tests of Significance.* In: Nonparametric statistics for the behavioural sciences, Ed. (2nd). McGraw-Hill, New York.

Solingen, R., & Berghout, E. (1999). *The Goal/Question/Metric Method*. McGraw-Hill, London.