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A Quality Metric for the Instructional Process: A Systems Approach

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A QUALITY METRIC FOR THE INSTRUCTIONAL PROCESS - A SYSTEMS APPROACH

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Abstract

This paper explores the issue of the monitoring and promotion of quality outcomes in the instructional process in higher education. A systems approach to quality assessment is adopted and contextualised within a processual model of teaching and learning that is based on input-process-output models of teaching. The teaching and learning environment is considered holistically and presented as a coherent integrated process with appropriate feedback mechanisms between the modules. Within the context of this model a two dimensional quality metric is developed which identifies the key factors in the assessment of quality in the instructional process. This quality metric is empowering within the teaching/ learning environment because it allows all stakeholders to have input into the ongoing evaluation and design of the instructional process. It also has considerable flexibility and enables new factors that emerge in the teaching/learning environment to be included in the quality assessment.

1. Introduction

Although most of the models of instructional design (Banathy 1968, Twelker 1972, Popham and Baker 1970, Hannum and Briggs 1980) describe the process of teaching as common sense by design, they differ considerably in the factors they consider, their value base and the frameworks they posit for assessing quality in instructional design. However, the above writers do share a systems approach to their different models of instructional design. The systems approach has been used in this research paper as the preferred theoretical framework because of its emphasis on the interrelationship between factors affecting the instructional process, and because of its capacity to allow the dynamic nature of instructional design to be more adequately explored than other theorectical frameworks.

This paper posits a model of instructional design within a systems framework and illustrates the implementation of it through a pilot study in the teaching of Computer Science units in a university degree program. It is a model aimed at quality improvement defined by Sachs (1994:24) as a process that is transformative within the organisation, controlled by the collegial staff, developed within a consensual negotiated framework, and with potential to develop and explore future change. This model takes the form of a two dimensional quality metric, an attempt to develop what Mackinnon (1992:63) describes as a "mapping of the dimensions of quality". However, this quality metric is first contextualised within a processual model of teaching and learning that we have developed. In this model, the component modules that comprise the teaching/learning environment are considered and presented as a coherent process with appropriate feedback mechanisms between the modules.

2. Background: A Processual Model of Teaching and Learning

This model identifies six input modules which determine the output in teaching and learning. Dochy, Seigers, and Wijnen (1990:145) discuss in detail the merit of input-process-output models in the quest to develop sets of performance indicators in higher education. Our six input modules include availablity of materials and equipment as the key resource inputs, together with teaching methods and the teaching environment. Both students and teachers have major inputs as the key stakeholders in the teaching/learning process. These six key inputs combine to determine the quality of the output and the evaluation of this output is a key part of teaching /learning process. This input-process-output model with its component modules is diagrammatically represented below :

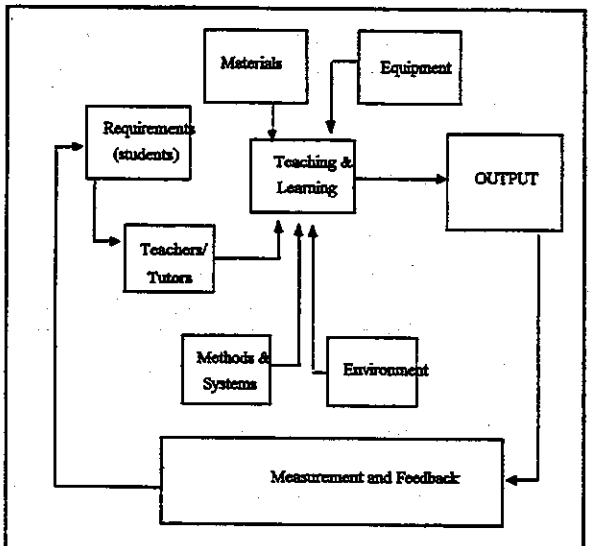

Figure 1. Systems Method For Instructional Design Quality

The two dimensional quality metric attempts to identify and provide a framework for evaluating the key input factors in the university teaching process, which underlie the six key input modules in the teaching and learning process, outlined above.

3. Outline of the Two Dimensional Metric

Like the other systems based models for instructional design, this model features recognition of the planning, development, delivery and evalution process, the formulation of goals appropriate to the environment, the students knowledge levels when entering the teaching/learning process, the measurement of students based on their ability, and the planning of appropriate instructional strategies (Hannum and Briggs,1980). While importance has been paid both to theorectical and practical components of instructional design, these models fail to establish parameters that can be observed either by an individual or a team of instructors so that the overall design can be improved. The major drawback of most of the models is the assumption that only one teacher is involved in teaching one subject at one location. The models have limited value for a team of instructors involved in teaching the same subject to a hybrid mixture of students at various locations.

To overcome this limitation the instructional model has been considered as a two dimensional process. The horizontal axis of the model in Table 1 specifies factors comprising the instructional process, and the vertical axis, factors of instructional design. This is extremely important in instructional models because the design itself can be analysed as two types: curriculum development and delivery. The curriculum development is about what to teach and the delivery is how to teach. If we fail to establish appropriate correlations between the two, the process as a whole will fail. Hence the two dimensional design. This two dimensional approach has been strongly recommended by Sparkes (1982) for media selection. In fact, there will be a good mapping of various parameters on this two dimensional design, and the map can serve as an instant guide to various people involved in the design. The first stage in designing the two dimensional metric is to identify various parameters that affect the performance. The identification should be based on what goals are to be achieved and how to achieve them. This What and How is the essence of obtaining the predefined level of quality. After careful elimination of unnecessary factors, a two dimensional metric was developed. It is shown in Table 1.

4. Systemic Implementation of Quality Metric Model

Once the above stage is finished, a system can be developed to implement it. As in any other systems development, this system comprises of various stages. Five stages have been identified processually as :

1 Identification of needs/inputs
2 Analyses of needs/inputs

Strong / Medium / Weak	Analyze Target Population	Lecture	Arrival	Environment	Material Layout	Workshop Handling	Key Point Highlight	Conduct Summary	End Of Session	Customer Feedback Analys	Small group classes	Projects	Assignments
Attitudes													
Skills													
Knowledge													
Understanding													
Techniques													
Analysis													
Synthesis													
Instructor													
Atmosphere													
Efficient use of class time													
Exam tactics													
Handouts													
Additional sources													
Agenda													
Documented objectives													

Factors of Instructional Process

Table 1. The Quality Matrix

3 Planning of change
4 Implementation of change
5 Evaluation of change /knowledge gained

4.1 Identification of needs/inputs

This stage of the model is used to acquire data about the requirements of the students. Some of the requirements include textbook usefulness, overhead usefulness, handout usefulness, presentation clarity, course completeness, concern for students, positive atmosphere, documented objectives, and efficient use of class time. Additional factors can be added to the quality metric as they are identified as priority needs of students. This demonstrates another strength of the metric. It is open to ongoing refinement and is adaptable to a wide variety of learning environments.

4.2 Analyses of needs/inputs

The analysis of needs of students is extremely useful when more than one instructor is involved in the teaching process. Every instructor can be given this diagram to help him/her understand the various components and their relationship in the system. This metric will also identify the variations that each instructor has in his/her session and demonstrate the relationship between factors comprising the instructional process and the factors comprising instructional design.

4.3 Planning of change

The above two dimensional metric is the quality assurance chart. The instructors are requested to plot various aspects using strong, medium or weak relationship. The quality metric is very useful to form the basis of a continuous improvement plan. Some of the key change actions will arise from analysis of the factors in the matrix.

4.4 Implementation of change

The instructor implements the actions outlined in the continuous improvement plan at this phase. Here consultation with other colleagues is facilitated by use of the quality metric which provides an excellent framework for mutual appraisal of curriculam development and delivery.

4.5 Evaluation of change/knowledge gained

The instructor now evaluates the results of changes that have been implemented through use of the metric. This is done by administering another survey. The students are required to assess their level of knowledge before and after the quality assurance mechanism. The instructor sets out goals so that gains in knowledge can be facilitated.

5. Evaluation of Quality Metric

In order to test the value of the two dimensional quality metric a pilot study was conducted with university computer science students. The courses taught were a word processing package and a spread sheet package. Prior to implementing the quality metric, students were asked to rate on a scale of five their satisfaction levels in terms of expectations, material coverage, level of coverage, catering to their needs, quality of materials, venue suitability and value of the knolwedge gained. The courses yielded an average less than 3.5 in almost all the aspects. The quality control metric was then implemented. On the basis of the findings, change was implemented at both curriculum design and process levels. The same set of students were again surveyed and asked to rate on a scale of five their satisfaction levels as done before. On this occasion, the level of satisfaction averaged at 4.2 on a grade point scale of 5. The level of satifaction reported on all aspects of evalution except coverage was higher for both the wordprocessing and spreadsheet courses. The differences may be attributed to motivation factors amongst participants. These findings indicate that the two dimensional quality metric has a contribution to make to monitoring quality outcomes in instructional design. These findings are represented diagrammatically in Figure 2.

6. Conclusion

The two dimensional quality metric proposed in this paper provides an innovative systemic approach to assess the factors influencing instructional content and processes. It provides a flexible model for improving quality outcomes in teaching in tertiary education, and promotes ongoing change by ensuring quality review in the teaching/learning process.

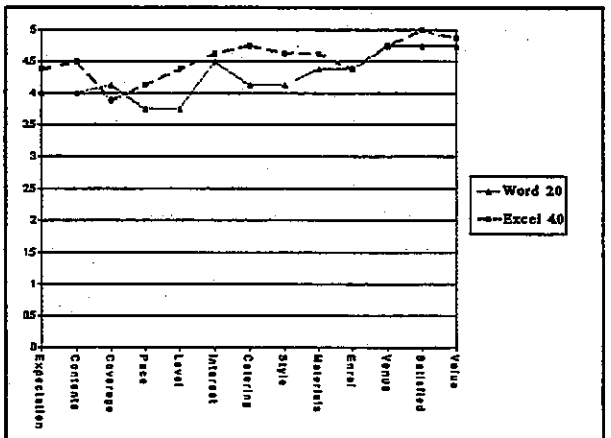

Figure 2. Results of Evaluation

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