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**IMPORTANCE OF FEEDBACK IN TEACHING, COMMUNICATION AND  
INFORMATION SYSTEMS FOR LEARNING**

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The paper discusses the importance and applications of feedback in teaching, communication and information systems for learning. In the first part of the paper, the author analyzes the value of feedback in these systems and examples of teaching activities. In the second part of the paper, the author describes implementation and design of an adaptive learning system aimed to increase performance in teaching and communication by using the information and examples described in the first part of the paper.

**Key words:** *feedback, information systems, communication systems, adaptive learning*

**1. Introduction**

Feedback is one of the most valuable tools in the learning systems because it allows us to monitor and improve students' performance in several ways. In designing information systems, feedback also has an important role because it helps us understand whether the targeted recipient (or the learner) got the full message (Nevio 2006: 439). According to Shannon's Communication Theory (Shannon 1949: 25-28), the targeted recipient should receive the message and encode it fully in order to participate in communication. On the other hand, the sender also has to make sure the message has been sent correctly by observing the recipient's interpretation which is also returned to the sender (Schramm 1954: 3-26). Hence, message sender also acts as a recipient of feedback. Feedback has a potential for measuring or detecting the communication errors.

Practically, these communication errors help educators to provide guidance to the students if the the errors of students can be tracked down. To find errors, the action or the objective must be known exactly. These errors help us monitor whether there is a gap between what should be happening and what is happening. On the other hand, finding communication errors without getting any feedback from the students is a difficult process.

There is a great chance to learn from those communication failures because they help learners to see their conditions and understanding. In real-life situations, these failures should also be used as an opportunity that leads to success. Manz (2002: 2 ) describes failures as opportunities in the following way:

Usually, failure or success is almost entirely in the eye of the beholder... Failure is very often a misconception about the difference between what exists and goes unnoticed (such as growth and learning when we fall short of reaching a goal) and what is realized later (longer term success).

Usually, students make many mistakes when they are new to the concepts and trying to discover these concept by themselves. In these cases, the best thing that can be done is to show students immediately what their mistakes are and let them have enough time and guidance to improve their performance in these parts that they had problems with. In general, if you give students enough room to work on their ideas, you should also give them a chance to fail and learn from their mistakes.

### **1.1 Teaching Activities and Feedback:**

There are several teaching activities that can be used that let the students work on their ideas and have a chance of failure. In these activities, the main roles of the teachers are to monitor students, track down their mistakes, let them know their mistakes and give them guidance to correct their mistakes. Discussions in online forums with brainstorming sessions, cooperative learning, worked examples, class projects – research and active learning based on classroom activities are the cases where the instructor can let their students make mistakes freely and provide guidance to improve the students' learning by using performance-related feedback. In these cases, feedback can be given immediately when the educator observes that the students have problems in understanding the concepts in the course. Additionally, to have that immediate feedback, the teachers should monitor students' activities by observing or asking questions to elicit an on-demand clarification.

In discussions, students can generate ideas freely and talk about these ideas. These discussions should start with a brainstorming session where all the students can present their ideas freely. Then they can discuss these ideas and evaluate each other's ideas. In that case, they can also learn further about certain ideas. The teacher can also lead these discussions to make students generate a final goal or

idea about the topic and she can also guide them to gain further understanding of the ideas.

Similar to the online discussions, the students can have activities in groups where they provide feedback to one another about their work. The teacher can monitor the groups' work by monitoring their activities regularly. If the teacher wants, she can also give feedback and guidance.

Worked out examples also provide a chance of failure and feedback. In the learning examples, the teacher can present the solutions in steps (some steps can also have missing parts for students to fill in) and she can give feedback to students as they work on these steps themselves. In that case, the students are using self-explanation to interpret the concept. The teacher also needs to check the correctness of these self-explanations by providing several complete examples and full practices.

In class projects, it is very hard to find a good reference point to measure the performance of the learners. However, it is quite possible to monitor whether the students are performing the steps correctly to reach the solutions. There could be many different solutions to a research or project problem which also brings about many strategies. However, most of the time the teachers are experienced enough to monitor these varieties of solutions and ways.

Active learning in class also enables students to utilize their own learning capacities and provides means for performance-related feedback. Similar to in-class projects and research, in active learning, students are required to participate in class. For example, they can participate in lectures by taking notes, asking questions, involving role-playing or games. The teacher can monitor these activities and provide feedback.

Other activities where students can have feedback include tests, inquiry, guided inquiry and scaffolding. However, in these activities, the teachers cannot monitor the whole ongoing progress to give immediate constructive feedback. They can just give formative feedback according to the students' end results. For example, mastery learning tests provide some results for students to have a corrective instruction and give chance to them to re-test; but it is so hard to detect the exact nature of the problem such as a misunderstanding of a student in a solution part of the problem which leads to wrong results in the test.

Sometimes it is very difficult to come up with good feedback, especially when the students have already developed certain skills and are experienced in the field of study. The teacher may think that the learners are good enough to find their own

mistakes. The teacher should provide assistance to students to improve their self monitoring abilities. Before seeking any help, the learners should be aware that they need help. According to Sadler (1989: 1-25), to detect a mistake or a problem, the learner has to have an understanding of the standard, to compare his current level of performance according to these standards, and to plan – get correct actions to fill the gap. This type of learning is also considered as self-regulated learning, where students compare their performance against a standards (Clearly & Zimmerman 2001: 61-82; Kitsantas & Zimmerman 1998: 220-239). According to several studies, frequent self-evaluation produced positive results regardless of the type of goal adopted (Kistansas et al. 2004: 269-287).

### **1.2. Using Feedback in Information Systems:**

The usage of computer-oriented learning systems can be very useful for those self regulated students. In such a learning environment, it is possible to provide feedback and support students' learning process. In a computer-mediated learning environment, self-regulated learners can monitor their performance while observing their actions in the system and they can also follow the feedback provided by the computerized system which is called Adaptive Learning System, Intelligent Tutoring System, Computer-Assisted Instruction, Computer-Based Instruction, Web-Based System, etc.

In such a computerized learning environment, students can get immediate feedback according to their performance in several computer-managed activities such as drill/practice, problem-solving, games, simulations, tutorials and online lectures. In these activities, students benefit from cooperative learning opportunities for peer feedback, such as online discussions with instant messaging or forums, online games, Wikis and online simulations.

The computers can also provide the opportunity to follow standard class activities in a local network or a web environment where a feedback mechanism can be supplied by the teacher, by the system itself or by both. These activities include virtual classes, online collaborative projects and E-portfolios.

Feedbacks may not work in the following situations:

First of all, in the web-based learning environments where students have to follow classes, there is a disadvantage of having immediate feedback. In these systems, the instructor can give you immediate feedback only in instant messaging or video conferencing sessions. Other feedback, such as posting feedback to the

response/answer or e-mailing, etc. are almost asynchronous and therefore they always come after the students perform actions. If the students do not get feedback immediately when the actions are performed, they could have problems in remembering their past thoughts and actions exactly. The same problem occurs in discussion forums: unlike instant messaging, it is sometimes hard to follow the concepts and flow of discussion because the students have to check the postings regularly. If students cannot remember the previous entries to reply to a posted question, they will miss the flow of the discussions easily. On the other hand, instructor can give formative feedback according to the outcome of students' performance, but the instructor also must spend time to read all the posts and evaluate these posts carefully in his spare time.

In discussion forums, students also receive good feedback from their peers because they have time to think about the responses and to construct good questions or feedback.

The most important disadvantage of these web-based learning environments is the lack of physical presence and body language such as face-to-face interaction and eye contact. Body language is a good communication tool where students respond and make assumptions about the signals or feedback given in class while they are interacting with the instructor. The instructor can also give feedback for the steps in the completed assignment if she has a key to these steps.

## **2. Implementation and Design of an Adaptive Learning System**

The best example of using feedback in information systems would be the usage of feedback in adaptive learning systems. Adaptive systems are basically designed to match the individual's special learning needs where the system monitors students' actions and tries to decide on providing services according to the learner's requirements. Generally speaking, these systems tailor learners' needs according to their modeling of the user. While modeling, users are required to undertake different kinds of activities and respond to many exercises. The main attributes of adaptive systems include presentation, content sequencing, navigation, analysis of student actions, feedback, and example problem solving (Weber 1999: 371-377; Brusilovsky 1996: 87-129). In the adaptive learning systems, monitoring, analyzing and sequencing modules are developed using a specialized algorithm which is tailored to the individual needs of the learners. Most of the algorithms process the learners'

response rate to determine their individual phases. According to the specific questions asked in the system (such as in test modules), the students' response time, accuracy or success, level of difficulty are determined to calculate the individual's learning rate.

In designing an adaptive learning system, the user's prior knowledge, age, gender, and individual beliefs must also be considered. To determine the prior knowledge levels, a pre-test session can be run. When designing adaptive learning systems based on giving feedback, we should consider the self-regulated learners as our main type of learners because they are more suitable to use such systems and they would be more successful in their self-monitoring, which is the key to success in using this type of systems. This aspect is very important because if the users are not self-regulated, they will have problems that we cannot solve in the design of the system. These problems may occur because the adaptive system cannot help students detect all the performance-related mistakes as the instructor does. The computer systems still have many problems and inabilities to understand the human actions exactly.

As in the case of all intelligent systems where there is a need for pooling, the adaptive systems also require great numbers of exercises and practice questions in order to have an effective individualization. Therefore we should have a large pool of content, questions and feedback related to these practices. The examples in the system can be designed as worked examples, completed worked examples and the full practices. The difficulty of the question can be measured according to the general success rate of the question calculated from the previous years. The questions can also be rated according to their category, which can be determined by using Bloom's categorization (Bloom 1956: 44-45).

In the feedback module, the system provides various kinds of questions such as matching, true/false, multiple items test, etc. The feedback system would support users immediately after they complete a specific task. The system should also provide a constructive type feedback rather than a formative one. In that immediate feedback, the module would also give an opportunity for further help seeking by the learners. This kind of on-demand help is useful for the self-regulated students.

In these additional help options, the learner can also connect to an instant messaging system to ask questions to his online tutors. The learners can also discuss some of the questions with their peers using forums, instant messaging or chat.

Additionally, a learner can see the other students' answers to the questions in the worked examples, as well as the system's or the instructor's solution. After the user completes a specific part of a task/group of tasks, she can continue to the next level according to his learning rate, which can be determined by the system. In addition to that, if there is an instructor available on site, the system reports to her and the instructor can monitor the student's level. For example, by entering the system as the moderator, the instructor can modify the level of a particular student. The instructor can also require the student to take more examples and. Besides, if there is a real-time instructor available in the system, she can directly assist the student in the system or give additional feedback by using video conferencing tools.

### **3. Conclusion**

In conclusion, the use of feedback in information systems for learning provides more effective communication opportunity between students and instructors. For example, implementing an adaptive learning system that gives feedback automatically according to students' actions may help students increase their performance.

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### **Apstrakt**

#### **VAŽNOST FIDBEKA U NASTAVI, KOMUNIKACIJI I INFORMACIONIM SISTEMIMA ZA UČENJE**

U ovom radu se razmatraju važnost i fidbeka u nastavi, komunikaciji i informacionim sistemima za učenje. U prvom delu rada autor analizira vrednost fidbeka u ovim sistemima i primere nastavnih aktivnosti. U drugom delu rada autor opisuje primenu i osnove sistema adaptivnog učenja koji ima za cilj da poboljša učinak u nastavi i komunikaciji koristeći podatke i primere opisane u prvom delu rada.

**Ključne reči:** *feedback, informacioni sistemi, sistemi za komunikaciju, adaptivno učenje*