Economides, A. A. (2009). **Conative feedback in computer-based assessment**. *Computers in the Schools*, Haworth Press. ISSN: 0738-0569, Electronic ISSN: 1528-7033. [SJR= 0.034 (2007); H-index= 1]. Accepted.

Conative Feedback in Computer-based Assessment

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Abstract

Feedback is an important educational tool which can support learning and assessment. This study describes types of conative feedback that can support the student's conation, will, volition, or motivation. Any of these types of feedback can be presented to the student before, during, or after an educational activity or a test question. Experimental results found higher student scores using conative feedback during computer-based assessment than without feedback.

Keywords: adaptive feedback, adaptive learning, adaptive testing, computer-based assessment, computer-based testing, conation, conational feedback, conative feedback, e-learning, interactive learning, intervention, motivation, scaffolding, self-efficacy, volition, will.

Conative feedback in computer-based assessment

Introduction

Many psychologists (Hilgard, 1980; Kolbe, 1997; Snow & Farr, 1987) consider three dimensions of the mind: cognition, affect, and conation. Although there is a vast body of research on cognition and learning, the effect of affect and conation on learning has received less attention. Conation is one's will, striving, and effort in a task. Conation is related to volition, self-efficacy, motivation, drive, persistence, and commitment (Huitt, 1999). Students should be helped to develop conative attitudes and skills (Barell, 1995), such as self-efficacy (Bandura, 1991, 1997); however, there is a lack of research on the interplay between learning and factors, such as intentions, will, volition, motivation, self-efficacy, confidence, commitment, and passion. Researchers (Martinez, 2001; Snow & Farr, 1987) advised that educators cannot ignore or overlook such key psychological aspects that affect learning and performance outcomes. This study investigates conative feedback trying to enhance the student's conation, will, volition, and motivation in order to increase learning achievements.

Currently, there is a concerted effort to develop computer-based systems that will support education. Computer-based systems support assessment by providing the student immediate feedback and grading (Baggott & Rayne, 2001). Despite the many benefits that feedback can provide to learning (Azevedo & Bernard, 1995), it has not been widely introduced into contemporary computer-based learning (CBL) and computer-based assessment (CBA) systems (Economides & Roupas, 2007).

Feedback is an important tool in student-centered education. Most studies have investigated the types of information available to the student (Kulhavy & Stock, 1989; Mason & Bruning, 2001). Previous studies on informational feedback suggest informing the

student during assessment about the questions, the answers, the results, and further educational material. Kulhavy and Stock (1989), and Mason and Bruning (2001) classified feedback into the following categories: no feedback, knowledge of response (KOR), answer until correct (AUC), knowledge of correct response (KCR), topic contingent, response contingent, bug related, and attribute isolation. KOR feedback verifies whether the student's answer is correct or incorrect without giving the correct response, while KCR feedback indicates the correct answer. AUC feedback requires the student to remain on the same question until he selects the correct answer. It engages the student in active processing following an error, and ensures that the last selection is the correct selection. However, it also frustrates the student who does not know the correct answer, but must continue responding until the correct answer is provided. Topic-contingent feedback provides verification and general elaborative information concerning the subject. After incorrect responses, students are directed to educational material where they can find the correct answer. Alternatively, they are given additional information from which they may extract the correct answer. Response-contingent (or extra-instructional) feedback provides both verification and question-specific elaboration. It provides the correct response and response-specific feedback that explains why the incorrect answer was incorrect and why the correct answer was correct. Bug-related feedback provides verification and presents common errors made by students. Attribute-isolation feedback provides question verification and highlights the central attributes of the subject.

Kulhavy and Stock (1989) considered that the feedback is composed of two elements: verification and elaboration. Verification is the information that the answer is correct or wrong, and is provided by KOR, KCR, and AUC feedback. Elaboration is any extra information beyond verification that guides the student toward the correct answer, and can be added to KOR, KCR, and AUC feedback. There are three basic types of elaboration: (a) task-

specific, as in a restatement of the correct answer or inclusion of multiple-choice alternatives, (b) instruction-based, an explanation or an excerpt from the educational material, and (c) extra-instructional, as in examples or analogies that were not part of the original instruction. They describe the feedback process as consisting of three cycles: cycle I, a task demand is presented and the student receives information from the task, processes this information, and produces a response to the task; cycle II, feedback is presented and is processed by the student to yield any response corrections; and cycle III, the original task demand is presented again as a test item, which is processed and responded to by the student to produce a post-test response. Butler and Winne (1995) assigned five functions to the feedback: confirming conditions, adding information, replacing or overwriting prior knowledge, tuning understandings, and restructuring schemata. Herschell, Greco, Filcheck and McNeil (2002) suggested that specific feedback is much more likely to influence student performance than haphazard, general feedback.

Conation would affect and be affected by learning. Thus, the feedback would also increase the student's engagement, confidence, motivation, and determination among other attributes. Educational methods can affect a student's motivation (Lumsden, 1994). Motivation can support learning in various ways (Ormrod, 2003): (a) direct behavior toward particular goals, (b) lead to increased effort and energy, (c) increase initiation of, and persistence in, activities, (d) enhance cognitive processing, (e) determine what consequences are reinforcing, and (f) lead to improved performance. Students would benefit from increased engagement and motivation to succeed (Anderman & Midgley, 1998). Students who are motivated to learn will have greater success than those who are not motivated to learn (Wlodkowski, 1999). Long, Monoi, Harper, Knoblauch, and Murphy (2007) found significant gender differences in goal orientation and achievement scores. Furthermore, self-efficacy and learning goals contributed to domain interests. Cole, Bergin, and Whittaker (2008) found that

students who report trying hard on low stakes tests score higher than those who do not try hard. The results indicate that if students do not perceive importance or usefulness of an exam, their effort suffers and so does their test score. Hong and Do (2008) found that a student's perceived test value had a significant direct effect on motivational and meta-cognitive regulation, as well as an indirect effect on test performance through the mediation of motivational regulation.

Bandura (1997) identified three different forms of motivation corresponding to three theories: attribution theory, expectancy-value theory, and goal theory. Based on these theories, feedback would help students attribute their learning outcomes to their effort. Also, the feedback would support the student's expectation regarding the value of the assessment. Finally, the feedback would help students achieve their goals. Bostock (2004) argued that objective testing, peer, group, and self-assessments often motivate students better than traditional examinations and coursework. Snow (1989) pointed out the need to test not only cognitive structures, but also conative structures, such as the self-regulatory function and the motivational orientations.

Keller (1987) presented several strategies for attracting attention, developing confidence, and making people feel satisfied with their achievement. He suggested using humour, participation, and unexpected actions. Similarly, Keller and Suzuki (1988) proposed motivational strategies for designing motivating courseware. Georgouli (2002) proposed an intelligent assessment system, which keeps track of the student's aptitude with respect to answers and observes the student's effort and confidence. Then, the system motivates the student, offering the appropriate help and the possibility to follow an individualized way through the objective items of the assessment. Lepper (1993) identified four main goals in motivating students: challenge them, give them confidence, raise their curiosity, and make them feel in control. Lepper, Woolverton, Mumme, and Gurtner (1993) considered that

motivation is comprised of confidence, challenge, control, and curiosity. They suggested increasing a student's confidence using praise and reassurance. Economides (2005) suggested personalized feedback based on the learner's cognitive, emotional, and conative states in order to enhance the learner's learning and state of mind. He presented the feedback attributes that would be adapted to the learner's characteristics.

Rebolledo-Mendez, duBoulay, and Luckin (2006) found a positive effect of the motivational scaffolding, particularly for initially unmotivated students who demonstrated higher learning gains. Nicol and Macfarlane-Dick (2006) suggested seven principles of good feedback practice that support self-regulation. Wigfield and Wentzel (2007), and Wentzel and Wigfield (2007), surveyed motivation interventions for enhancing a student's academic and social outcomes in school. Hudley, Graham, and Taylor (2007) described attempts to enhance student personal responsibility. Hurley and Weibelzahlm (2007) surveyed on-line tutors regarding how they motivate their learners. An intelligent tutoring system would select the most appropriate motivational strategy depending on the learner's self-efficacy, goal orientation, locus of control, and perceived task difficulty. Lam, Yim, and Ng (2008) found that the motivational effects of praising effort depend on beliefs in the effort–ability relationship. The more the participants believed that effort and ability were positively related (versus negatively related), the more they would have positive self-evaluation and intrinsic motivation after praise for effort. Boyer, Phillips, Wallis, Vouk, and Lester (2008a) found that tutorial strategies intended to maximize student motivational outcomes (e.g., self-efficacy gain) may not be the same strategies that maximize cognitive outcomes (i.e., learning gain). Boyer, Philips, Wallis, Vouk, and Lester (2008b) investigated the tradeoffs between cognitive and motivational strategies. For low self-efficacy students, direct stand-alone encouragement can be used to increase self-efficacy, but the same stand-alone encouragement may not be helpful for high self-efficacy students.

The current study investigated the possibility of supporting the student by providing conative feedback during learning or assessment. This conative feedback attempted to support and enhance the student's will and volition to learn and succeed in the assessment. For example, the CBA system may challenge the student by presenting difficult questions that correspond to higher scores, or by informing the student how other high ability students perform. Then, the CBA system may establish positive expectancies for success and when the student succeeds to attribute the success to the student's own abilities and efforts. Also, it may offer options to the student, so the student can select the difficulty level of the questions. In this way, the student may have the sense of being in control. Finally, the CBA system may praise the student for achievements. In the current study, "conative feedback" refers to feedback that attempts to enhance the student's conation, will, volition, and motivation.

The next section presents the adaptive conative feedback model. Then, various conative feedback types are presented. Furthermore, conative feedback is classified according to the activation instance. An experiment follows. Finally, conclusions are drawn and directions for further research are proposed.

Adaptive Conative Feedback

The CBA system records the characteristics of both the student (e.g., psychological, educational, and preferences) and the educational activity (e.g., expected outcomes, instructional method, and learning theory). Then, at appropriate instances, the CBA would present adaptive conative feedback to the student, depending on the characteristics (stable and transient) of the student and the educational activity (Figure 1). For example, if a student has low self-esteem, then the adaptive conative feedback would attempt to persuade the student that he/she could succeed if he/she wanted to. Furthermore, multiple levels of

feedback intensity may exist for each conative feedback type. For example, if a student has extremely low self-esteem, then the corresponding conative feedback would be activated. However, this is a too ambitious research task. Further research on adaptive conative feedback is needed. Next, we present various conative feedback types.

Conative Feedback Types

The CBA system continuously tracks the student's reactions and identifies the student's current state. At appropriate instances, it provides the student personalized conative feedback according to his/her current state. In this section, we classify the conative feedback with respect to what it attempts to trigger and inspire the student. Then, in the next section, we classify conative feedback with respect to the triggering instance.

In the classification with respect to the conative type, we consider two conative feedback categories: (a) positive conation feedback, and (b) control of negative conation feedback. Let us first describe these categories.

Positive conation feedback tries to develop, maintain, and increase positive conation to the student (Figure 2). So, positive conation feedback may attempt to increase the following:

1. *Self-awareness and self-consciousness*: a student's ability to be aware of and perceive one's self, existence, identity, and state.
2. *Interest, will, and volition*: a student's interest, desire, will, intention, conscious choice, and decision to learn, succeed in the assessment, and self-improve.
3. *Self-efficacy, self-esteem, and confidence*: a student's belief and trust on oneself and one's ability to learn, succeed in the assessment, and self-improve.
4. *Motivation*: the driving force that stimulates a student to learn, succeed in the assessment, and self-improve.

5. *Self-direction and goal-orientation*: a student's ability to identify a goal and follow the path towards achieving it.
6. *Commitment, dedication, determination, and persistence*: a student's continuous engagement and binding towards learning, succeeding in the assessment, and self-improving.
7. *Self-regulation, control, and autonomy*: a student's ability to regulate himself, his cognition, emotions, effort, and time.

For example, in order to increase a student's interest on the learning and test, the feedback may inform the student about the meaningfulness, usefulness, importance, and significance of the learning (in general, as well as for the specific subject) and of succeeding in the test. It may increase student's trust on the test by showing to the student validity and reliability statistical results. It may spur a student's curiosity about the next subject or question. It may challenge the student by inviting the student to answer difficult questions and solve difficult problems. It may increase a student's belief in himself/herself and on his/her specific abilities by praising him/her for correct answers and innovative ideas. It may increase a student's belief that his/her effort leads to success and on his/her expectancy for success by showing successful answers and accomplishments. It may increase a student's self-efficacy by showing that other students with similar abilities have succeeded in the test. It may motivate the student by showing the rewards, gains, profits, earnings, and benefits from learning (in general, as well as the specific subject) and succeeding in the test. In order to help the student plan and implement learning and test-taking strategies, it may notify the student about current results and remaining time. It may help the student to manage and control time and actions by suggesting time spent per question. It may gain the student's attention, focus, and concentration using multimedia. It may support and reward the student's

efforts, courage, patience, and discipline. It may offer alternatives (with or without) arguments for the student to choose from.

Control of negative conation feedback tries to control the student's negative conation and attitudes (Figure 3), such as the following:

1. *Self-ignorance:* a student's lack of knowledge about himself/herself and his/her state.
2. *Disinterest*: a student's lack of interest and will to learn and succeed in the assessment.
3. *Self-doubt and insecurity*: a student's doubt about his/her abilities.
4. *Discouragement*: a student's loss of courage and enthusiasm to learn and succeed in the assessment.
5. *Disorientation and distraction*: a student's confusion, loss of orientation, and attention diversion from learning and assessment.
6. *Reluctance and hesitance*: a student's indecision to make choices and act during learning and assessment.
7. *Disorganization*: a student's inability to organize his/her efforts and time.

For example, the feedback may decrease the student's insecurity and doubt regarding abilities and success by showing him/her that he/her is achieving above average. It may keep the student focused on the test by presenting pragmatic and authentic questions relevant to the student's experiences. It may overcome the student's reservation and hesitation to move forward to the test by adjusting the difficulty level of the questions to the student's abilities. It may help the student to organize efforts and time by recommending tactics.

Activation Instance of the Conative Feedback

Depending on the time of appearance of the conative feedback, we classify the conative feedback in the following ways:

(a) *In advance of conative feedback*: it motivates a student and increases one's willingness to succeed before an action. For example, it explains to the student the test's usefulness, meaningfulness, appropriateness, reliability, validity, accuracy, fairness, security, and confidentiality. It may also inspire the student's curiosity and gain the student's attention.

(b) *Immediate conative feedback*: it motivates a student and increases the student's willingness to succeed immediately after an action. For example, it may assure the student that he/she is doing well and is on the proper route. It may also stimulate and challenge the student.

(c) *Delayed conative feedback*: it motivates a student and increases the student's willingness to succeed some time after an action. For example, it may enhance the student's self-direction and confidence. It may reduce the student's shame, guilt, and embarrassment.

More specifically, for the conative feedback in assessment, we distinguish: (a) pre-test conative feedback, (b) pre-answer conative feedback, (c) after-the-answer conative feedback, and (d) after-the-test conative feedback.

*Pre-test conative feedback***:** it is presented to a student on the student's request, or on the teacher's request, or automatically based on the student's current state before the test starts. It aims to develop a positive attitude. So, it may try to do any of the following:

- Help a student become aware of the student's state.
- Challenge a student and promote competition with the student's previous performance, other students, the computer, and the clock. Spur the student's curiosity about the test. Persuade the student about the value, importance, and significance of the test. Assure and explain the usefulness and meaningfulness of the test subject.

Increase the student's interest on the subject and the test. Amplify the student's volition and willingness for success and achievement. Extend the student's expectations of the test benefits. Increase the student's optimism about succeeding in the test.

- Support a student's self-esteem. Increase the student's belief in himself/herself on intelligences and abilities. Enhance the student's confidence on competence, efficiency, and effectiveness. Develop the student's belief that his/her efforts lead to success. Increase the student's belief and expectations on succeeding in the test.
- Motivate a student by showing the rewards, gains, and earnings if he/she succeeds in the test. Raise the student's expectations. Show the student the benefits and profits of learning the test subject. Show the student the subject's practicality in real life cases. Convince the student on the utility and worthwhile of the test.
- Help a student to set goals, make plans, and apply strategies in taking the test. Support the student's focus on succeeding in the test. Reduce the student's distractions from secondary issues. Decrease the student's confusion about the purpose of the test and the test-taking strategies. Support the student's orientation during the test with respect to the time, the subtopics, the difficulty levels, the resources, and the thresholds.
- Increase a student's commitment and dedication to the test. Amplify the student's determination to success. Reduce the student's timidness and reservations.
- Support a student's self-regulation and self-control. Help the student organize his/her time, effort, and energy.

Pre-question conative feedback: it is presented to a student on his/her request, or on a teacher's request, or automatically based on the student's current state after a question is

presented and before the student answers it. It aims to stimulate the student. So, it may try to do any of the following:

- Help a student become aware of his/her current state. Record and present the student's reactions to the question. Help the student to accurately estimate his/her knowledge and abilities to answer the question correctly.
- Challenge a student. Spur the student's curiosity about the question. Explain to and persuade the student about the importance and meaningfulness of the question. Amplify his volition and willingness to answer correctly. Increase the student's expectations and optimism of achieving a high score.
- Develop a student's self-esteem and confidence. Increase the student's belief in himself/herself, on intelligence and on abilities. Persuade the student that if he/she tries hard, then he/she can answer correctly. Reduce the student's doubts about his/her competence.
- Motivate a student by showing the rewards of answering correctly. Convince the student on the utility and worthwhile of succeeding. Show the student practical applications of the subject. Raise the student's expectations for success.
- Help a student to use the time and the resources efficiently. Gradually direct the student to answer the question. Help the student to select alternatives and making decisions. Support the student's focus and concentration on the question. Reduce the student's distractions from secondary issues. Decrease the student's confusion about the question and the possible answers. Support the student's orientation with respect to the time, the difficulty level, the resources, and the thresholds.
- Develop a student's commitment and determination to succeed. Support the student's effort, persistence, and courage. Reduce the student's hesitance to decide about the correct answer.

- Support a student's self-regulation and self-control. Help the student organize and manage the student's time, energy, and efforts to answer correctly.

After-the-answer conative feedback: it is presented to a student on his/her request, on the teacher's request, or automatically based on the student's current state after answering the question. So, it may try to do any of the following:

- Help a student become aware of his/her current state. Record and present the student's reactions to the result of the answer. Evaluate and present the student knowledge and abilities with respect to the answer.
- Challenge a student by showing the results of other students. Persuade the student about the value and utility of the answer. Develop the student's volition and willingness for success and achievement. Increase the student's optimism about succeeding in the test. Increase the student's expectation for the benefits.
- Develop a student's self-esteem. Increase the student's belief in himself/herself, on the student's intelligence and abilities. Increase the student's confidence on his/her competence, efficiency, and effectiveness. Assure that the student's efforts lead to success. Extend the student's belief and expectations on succeeding in the test.
- Motivate a student by showing the rewards, gains, and earnings of succeeding in the test. Convince the student on the utility and value of the test. Show the student the application of the question-answer subject in practical cases. Raise the student's expectations.
- Help a student to organize and plan his/her effort, energy, time, and strategy. Help the student on selecting alternatives and making decisions. Support the student to keep on track toward success. Enhance the student's focus on succeeding in the test. Reduce the student's distractions from secondary issues.

- Increase a student's commitment to succeed in the test. Support the student's effort, persistence, perseverance, and courage. Reduce the student's reluctance to make decisions and proceed in the test.
- Support a student's self-regulation and self-control.

After-the-test conative feedback: it is presented to a student on his/her request, a on teacher's request, or automatically based on the student's current state after the end of the test. It aims to support the learner's self-assurance. So, it may try to do any of the following:

- Help a student become aware of himself/herself. Record and present her striving, efforts, and reactions during the test. Evaluate and present her personality, intelligences, abilities, and characteristics.
- Challenge a student to continue for more advanced studies. Show the student the rewards, gains, and benefits of the test results and achievements. Amplify the student's volition and willingness for success and achievement.
- Develop a student's self-esteem and his/her belief in himself/herself, on intelligences and abilities. Increase the student's confidence in his/her competence, efficiency, and effectiveness. Support the student's belief that the efforts lead to success.
- Motivate a student for further achievements by showing the future gains and earnings. Show the student the usefulness and relevance of the subject to real life cases.
- Help a student to set future goals and make plans by showing to the student the perspectives.
- Develop the student commitment to learning. Increase the student determination to success. Decrease the student's reluctance to strive for learning and success.
- Support a student's self-regulation and self-control.

Experiment

In order to investigate the effectiveness of conative feedback, we implemented it in a computerized adaptive test (CAT). In CAT, if the student answers a question correctly, then the next question is more difficult, otherwise an easier question appears. Of course, the score for each question depends on its level of difficulty. So, different questions and different sequence of the questions may appear each time a student takes the test. In the experiment, the CAT asked questions related to introductory computing. The questions were of five levels of difficulty. An example question follows: “It is given an unsorted list of 5 integers: 4, 21, 8, 7, 15, and 9. How many permutations of the list elements should the bubble sort algorithm perform in order to sort the list in an increasing order? Answers: (a) 4, (b) 5, (c) 8, and (d) other.” In each test, there were 15 questions.

Forty students sat the self-assessment test both with conative feedback and without any feedback. The purpose of the test was to self-assess their knowledge on introductory computing. Each one of them took the test voluntarily, alone, and independently from the others. One-half of the students took first the test with conative feedback and then without any feedback. The other one-half of the students followed the inverse way. So, 80 different tests (different questions, different sequence of questions, and different difficulty levels of questions) were issued and answered by the students. The students were first and second year graduate students in M.Sc. Information Systems. The majority (85%) of the students were males. In the conative feedback case there was an appropriate encouraging message. If a student answered a question correctly, an appropriate message of praise appeared, and then a more difficult question followed. If a student answered a question incorrectly, an appropriate message of encouragement appeared, and then an easier question followed.

More specifically, in case of a very easy question, if the student answered correctly, then the message of praise was: “Good work! Continue like that.” Otherwise, the encouraging message was: “Try a little harder. You can answer this question.” In case of an easy question, if the student answered correctly, then the message of praise was: “You are doing great! You are ready for more difficult questions.” Otherwise, the message of encouragement was: “You can do better at the next question.” In case of a moderate question, if the student answered correctly, then the message of praise was: “Congratulations! The question wasn’t easy. Continue like that.” Otherwise, the message of encouragement was: “Never mind. The question wasn’t the easiest one.” In case of a hard question, if the student answered correctly, then the message of praise was: “Congratulations! The question was hard and you corresponded.” Otherwise, the message of encouragement was: “The question was hard. You are doing well though.” Finally, in case of a very hard question, if the student answered correctly, then the message of praise was: “Congratulations! You answered one of the hardest questions correctly.” Otherwise, the message of encouragement was: “Never mind. This was one of the hardest questions.” The maximum possible score was 100. The following Table 1 presents the students’ scores with and without conative feedback.

Next the paired samples t-test was applied on the students’ scores with and without conative feedback. Their scores with conative feedback ($M = 59.5$, $SD = 13.78$) were higher than those without feedback ($M = 53.5$, $SD = 15.45$), $t(39) = 7.65$, Correlation = 0.95, $p = 0.001$, Cohen’s $d = 1.209$. These results validate the importance of the conative feedback. However, further research is needed to investigate the effect of conative feedback on the student’s score.

Conclusions and Future Research

Feedback is an important mechanism in learning. The usual use of feedback in CBA systems is to inform a student of the score, on the correct answer, and on additional educational material on the subject. In this paper, we suggest the use of feedback to also develop the student's willingness and volition to learn and succeed in the test. We present various types of conative feedback. The CBA system may present conative feedback to a student before the beginning of the test, after the question presentation, and before one's answer, after one's answer, and after the end of the test. For example, the feedback may increase a student's trust on the test by showing scientific results on the question's validity and reliability. It may motivate one by showing the gains, earnings, and benefits from learning (in general, as well as the specific subject) and succeeding in the test. It may show understanding to the student by agreeing on the difficulty of the question. Also, if the student answers correctly, a bravo could increase one's confidence. If the student answers incorrectly, a hint or an alternative question version with encouraging comments may help.

Then, we used such a conative feedback during a computer-based assessment case. It was shown that conative feedback enables students to achieve higher scores. However, further experimentation is needed. Large groups of examinees would take adaptive tests with and without conative feedback at various educational disciplines and various educational situations (e.g., self-assessment and game-based learning). It is also interesting to investigate the effect of conative feedback to various student profiles. For example, student classifications would be done with respect to age, level of education, personality, style of learning, psychology profile, and level of achievement. This study may stimulate further research on matching the student's state to the invoked conative feedback. Thus, when the CBA system recognizes that the student is in a specific state, then the appropriate conative feedback would be invoked. Furthermore, conative feedback would be used not only in

testing (formal or informal), but also in other educational activities (e.g., autonomous or collaborative learning, mobile learning, and discovery learning).

Acknowledgments

The author would like to thank Mr. C. Roupas for programming the system.

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Table 1

Students' scores with and without conative feedback

with conative feedback: 35, 35, 45, 45, 45, 45, 45, 45, 45, 45, 55, 55, 55, 55, 55, 55, 55, 55, 55, 55, 55, 55, 55, 55, 65, 65, 65, 65, 65, 65, 75, 75, 75, 75, 75, 75, 85, 85, 85, 85.

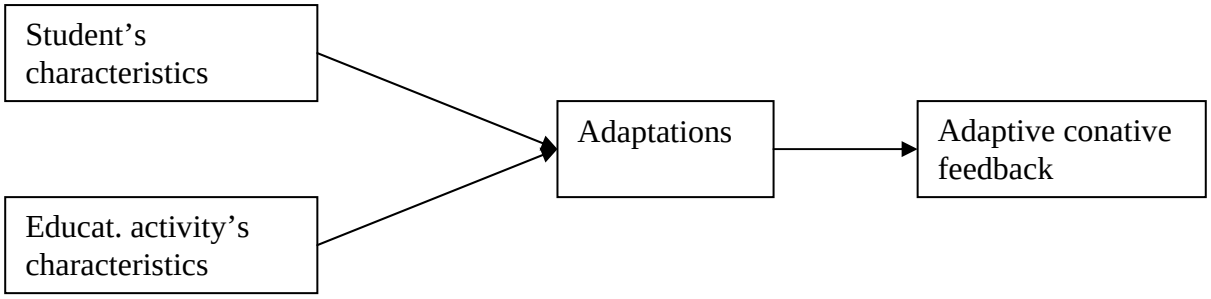
without conative feedback: 25, 25, 35, 35, 35, 35, 35, 35, 45, 45, 45, 45, 45, 45, 45, 45, 45, 45, 55, 55, 55, 55, 55, 55, 55, 55, 55, 65, 65, 65, 65, 65, 65, 65, 65, 75, 75, 75, 75, 85, 85.

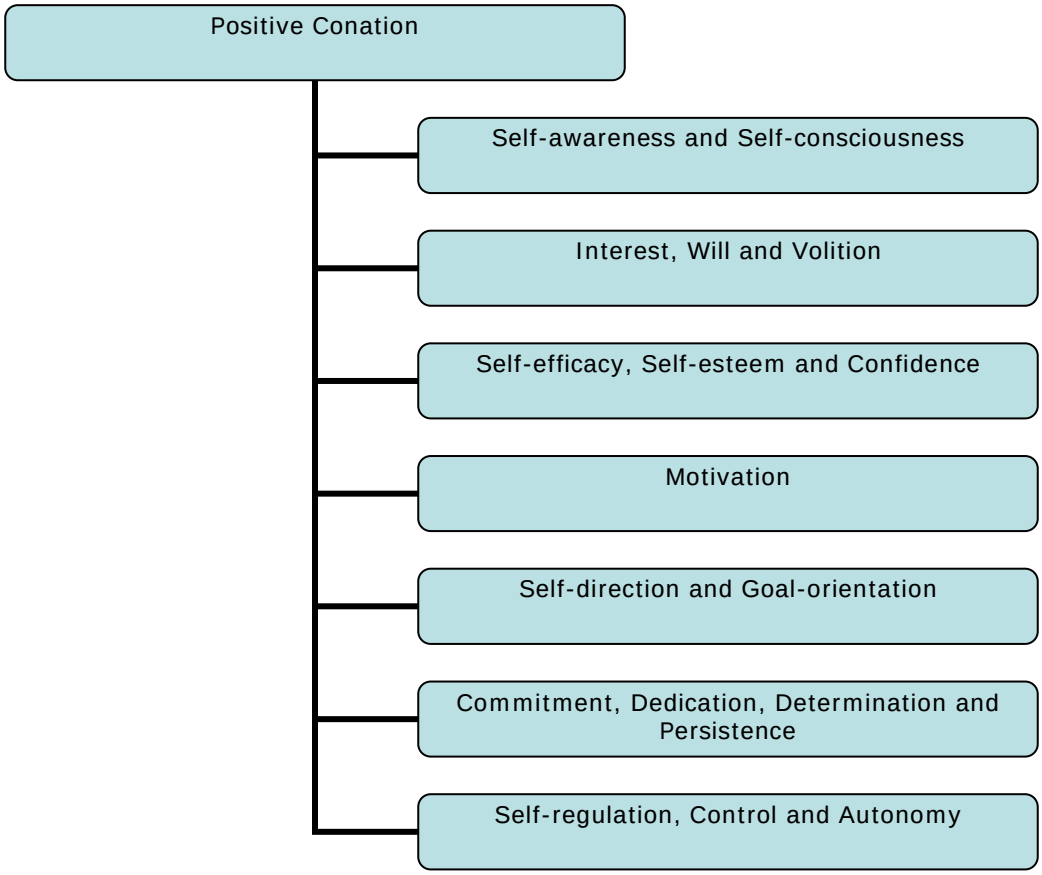
Figure Captions

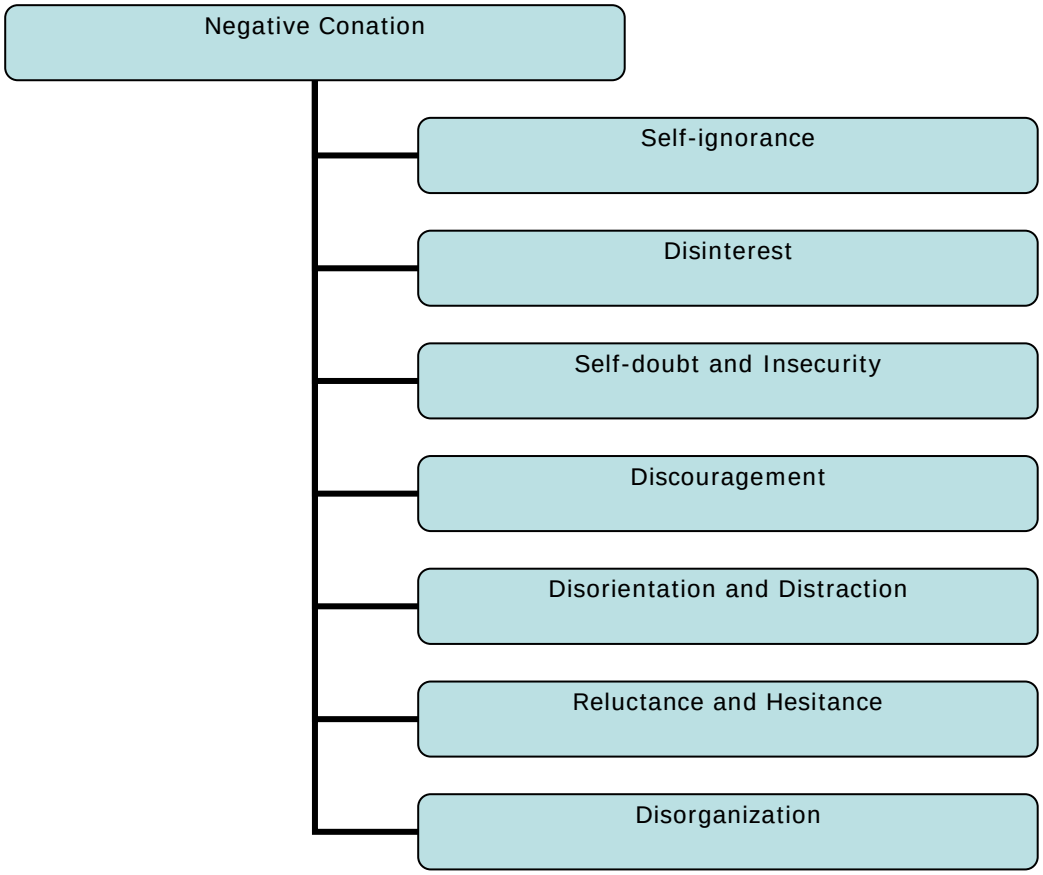
Figure 1. Adaptive conative feedback

Figure 2. Positive conation types.

Figure 3. Negative conation types.


Student's characteristics
Educat. activity's characteristics
Adaptations
Adaptive conative feedback


Positive Conation
Self-awareness and Self-consciousness
Interest, Will and Volition
Self-efficacy, Self-esteem and Confidence
Motivation
Self-direction and Goal-orientation
Commitment, Dedication, Determination and Persistence
Self-regulation, Control and Autonomy


Negative Conation
Self-ignorance
Disinterest
Self-doubt and Insecurity
Discouragement
Disorientation and Distraction
Reluctance and Hesitance
Disorganization

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