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Individualized Instruction in Computer-Assisted Instruction

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ABSTRACT: The improvement of instruction has been a goal of educators as far back as the teachings of the Greek philosopher Socrates. There are a wide variety of approaches, in most cases instruction can be characterized by the following tasks: setting objectives, teaching content based on these objectives, and evaluating performance. However, there have been many advocates of alternative approaches. Among the alternative approaches there is a focus on a more individualized approach to instruction, where the traits of the individual learner are given more consideration that is way so many researchers have studied the individualized instruction. Individualized instruction means giving suitable instruction to each student, Individualized instruction has the potential to improve instruction by varying the pace of instruction, the instructional method, and the content. Most approaches allow for self-pacing, yet variation in method and content is rare, and when it does occur, is usually very limited. In this paper the researcher has tried to bring a common face of instruction by individualization approach and define and describe its approach and advantages and also disadvantages of individualized instruction.
Key words: Individualized Instruction, CAI

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INTRODUCTION

Brief history of Computers and Individualization: In the 1980s, the growth of individualized instruction slowed, there continued to be much interest in it, and in 1986, more than 100 American universities had individualized instruction programs, and 200 more were interested in developing them. (Harlow, 1987). Computers were considered ideal for use in individualized instruction. At the University of Illinois, a program called PLATO was developed. It included a huge amount of instructional material, and it was sold both in and out of the United States.

What is Individualized Instruction?: It is not a method or technique but philosophy of education (Altman, 1972). Individualized instruction means giving suitable instruction to each students. It is not teacher centered, and different students learn using different methods and at different paces. It is student-centered education, and its purpose is helping students learn what they need using their own learning style and at their own pace (Altman, 1972). It involves letting individuals decide, in consultation with the teacher, what is best for students. The improvement of instruction has been a goal of educators as far back as the teachings of the Greek philosopher Socrates. Although there are a wide variety of approaches, in most cases instruction can be characterized by the following tasks: setting objectives, teaching content based on these objectives, and evaluating performance. This formula is indeed the most common; however, there have been many advocates of alternative approaches. Among the alternative approaches there is a focus on a more individualized approach to instruction, where the traits of the individual learner are given more consideration. Each approach to individualizing instruction is different, but they all seek to manipulate the three following fundamental variables:

- Pace: the amount of time given to a student to learn the content
- Method: the way that the instruction is structured and managed
- Content: the material to be learned

Pace

There are two basic extremes when the pace of instruction is considered. The first is when someone other than student, usually a teacher or instructor, controls the amount of time spent learning the material. In this case specific due dates are defined before instruction begins. This is currently the predominant model in most educational systems. The opposite extreme would be if the learner had exclusive control over the pace of instruction, without a time limit. Between these two extremes are situations where control of the pace of instruction is shared or negotiated, not necessarily equally, by the teacher and learner.

As theories of learning and instruction develop and mature, more and more consideration is given to the way in which learning occurs. In an attempt to account for the way that students learn, instructors may apply a combination of theories and principles in preparing instruction. This can influence whether instruction is designed for one homogenous group, or is flexible, in anticipation of individual differences among learners. In the majority of cases, instruction is designed for the average learner, and is customized ad-hoc by the teacher or instructor as needed once

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instruction begins. This type of instruction, although it does give some consideration to individual differences among learners during instruction, does not fall into the typically accepted definition of individualized instruction. For instruction to be considered individualized, the instruction is usually designed to account for specific learner characteristics. This could include alternative instructional methods for students with different backgrounds and learning styles.

To help clarify this point, the instructional method used can be considered in terms of extremes. In the first extreme, one instructional method is used for everyone. Terms like inclusion and mainstreaming have been used to describe this first case. In the second extreme, a specific instructional method is used for each individual. Between these extremes lie situations where students are arranged into groups according to the characteristics. These groups can vary in size, and the instructional method is tailored to each group.

Perhaps the least frequently modified component is the actual learning content. However, it is possible to vary the content taught to different learners or groups of learners. Both "tracking" and "enrichment" are examples of customizing instructional content. A renewed movement toward learner-centered principles in education has given this component more consideration in the 1990s. It has become possible to find examples of instructional settings in which students define their own content, and pursue learning based on their own interests. In most cases, however, this opportunity is limited to high-achieving students. In terms of extremes, content can be uniform for everyone, or unique to each individual. Between these extremes lie cases where the content can be varied, but only within a predefined range. The range of activities available to the learner is an indicator of how individualized the content is in an instructional setting.

Examples of Individualized Instruction

There are many examples of instructional approaches that have modified some or all of these three components. In all of these examples, the goal was to improve the instructional experience for the individual learner. Some of the most historically notable approaches are discussed below. Within each example both the benefits and criticisms of each approach are discussed.

Personalized System of Instruction, Introduced in 1964 by Fred Keller, the Personalized System of Instruction, or the Keller Plan, is perhaps one of the first comprehensive systems of individualized instruction. Keller based his system on ten accepted educational principles (McGaw, p. 4):

1. Active responding
2. Positive conditions and consequences
3. Specification of objectives
4. Organization of material
5. Mastery before advancement
6. Evaluation/objectives congruence
7. Frequent evaluation
8. Immediate feedback
9. Self-pacing
10. Personalization

None of these ten principles should be considered unique, as they all can be easily found in other more traditional educational settings. Rather, it is the components of the Keller plan - based on these ten principles - that makes the Keller Plan somewhat different: self-pacing; unit mastery; student tutors; optional motivational lectures; and learning from written material. It is the first component, self-pacing, that is the most obvious attempt at individualizing the instruction. From the second component, unit mastery, it can be seen that the content does not vary, as the unit content is fixed. To illustrate the static nature of the content, Mike Naumes describes the basic design of a course using Keller's personalized system of instruction: breaking the material of the course into several units dividing the material into units one to two weeks long as each unit of material is covered; specific learning objectives are given to the students. These state exactly what a student must know to pass a unit quiz.

The last three components indicate that the method of instruction does vary slightly from individual to individual. Although all students learn from written material and student tutors, the motivational lectures are optional. Making these lectures optional does constitute some flexibility in terms of instructional method, albeit extremely limited. Fundamentally, it is the self-pacing that more or less stands alone as the individualized component of this instructional system.

Proponents of the Keller Plan cite many benefits, including better retention and increased motivation for further learning. At the same time, there are others with criticisms of the Keller Plan such as the following: limited instructional methods, high dropout rates, and decreased human interaction. The debate over the effectiveness of Keller's Personalized System of Instruction, with its advantages and disadvantages, raises fundamental questions about the nature of self-contained, self-paced learning. There are indeed opportunities for designing instruction that lend themselves to the Personalized System of Instruction approach. This would apply especially to cases where enrollment is high, course material is standardized and stable, and faculty resources are scarce. On the other hand, when there

is not a shortage of faculty, or the class size is not large, the course would be better taught with more conventional methods, yet still based on sound educational principles. Where the line is drawn on the continuum between these two extremes is a matter of opinion, and should be based on the context in which the instruction is to take place. It would be inappropriate to claim that one of the extremes is completely right, and the other wrong, given the vast number of studies and evaluations that support either side.

Audio-Tutorial, Audio-Tutorial is a method of individualized instruction developed by Samuel N. Postlethwait in 1961 at Purdue University. His goal was to find an improved method of teaching botany to a larger number of college students and to effectively assist the students who possessed only limited backgrounds in the subject. The development of an Audio-Tutorial program requires a significant amount of planning and time by the instructor. Although there is some room for modification for each specific program, the general principles remain the same. Students have access to a taped presentation of a specifically designed program that directs their activities one at a time. The basic principles of Audio-Tutorial are "(1) repetition(2) concentration; (3) association; (4) unit steps; (5) use of the communication vehicle appropriate to the objective;(6) use of multiplicity of approaches; and (7) use of an integrated experience approach" (Couch, p. 6).

The major benefits of Audio-Tutorial are that "students can adopt the study pace to their ability to assimilate the information. Exposure to difficult subjects is repeated as often as necessary for any particular student" (Postlethwait et al., 1972), In addition to taking more time if they wish students can also accelerate the pace of their learning. Other benefits are that students feel more responsible for their learning, and more students can be accommodated in less laboratory space and with less staff.

Some of the major criticisms that are common to Audio-Tutorial courses were illustrated by Robert K. Snortland upon evaluating a course in graphics design. The primary criticism concerns the claim of responsibility. It seems that some students respond to the responsibility placed upon them, while others do not. There was a problem with the initial dropout rate, which seemed to be explained by the lack of willingness of some students to take on the amount of responsibility that was required in order to complete the course. Snortland advised that "since many freshmen students are not ready for additional self-discipline required of them in the A-T format, the choice of either a structured approach or an individualized approach should always remain open" (p. 8). Many other criticisms of Audio-Tutorial courses are concerned with teacher control. The instructor dictates all of the material including the learning and feedback procedures. The criticism is that this is a severe form of teacher control over the student.

Like the Keller Plan, Audio-Tutorial allows the individual student to determine his or her own pace, and the content is fixed. Unlike the Keller Plan, however, there are more instructional delivery methods available when designing the course. Yet the locus of control remains with the instructor in the Audio-Tutorial as well.

Computer-Assisted Instruction (CAI), most proponents of individualized instruction saw the computer as a way to further improve the design and delivery of individualized instruction - now in an electronic environment. With the advent of the computer came the potential to deliver individualized instruction in a more powerful way. This potential was anticipated long before the proliferation of the home computer. John E. Coulson wrote in 1970: "A modern computer has characteristics that closely parallel those needed in any educational system that wishes to provide highly individualized instruction"(p. 4). He also noted the specific benefits that the computer could offer (p. 5):

1. "It has a very large memory capacity that can be used to store instructional content material or...to generate such material."
2. "The computer can perform complex analyses of student responses."
3. "The computer can make decisions based on the assessments of student performance, matching resources to individual student needs."

Distance education. A surge in the number of nontraditional students attending college in the 1990s, combined with the technological potential of the Internet, has caused a renewed effort to deliver instruction in a nontraditional fashion. Accessibility and convenience - not research - are the primary driving forces in this movement toward instruction in the form on online education. When reviewing more than 200 articles on online instruction over the 1990s, James DiPerna and Robert Volpe found that only one article directly addressed the impact of the technology on learning. Partnerships between businesses and institutions of higher learning have arisen to address the increased need for continuing education.

Whether it is more effective or less effective than traditional education seems less a concern. In many cases, the audience addressed is nontraditional, and they have limited access to traditional education. Additionally, many students who could otherwise attend brick-and-mortar institutions are choosing

online education for the convenience. In other words, what was established initially due to necessity has now expanded as students choose this route because of its convenience. The rate of expansion of online education has accelerated to a point where the general feeling among institutions of higher learning is of willing participation. In terms of pace, method, and content, there is a large variety of competing approaches to distance education, and no dominant model has emerged. Like previous iterations of individualized instruction, it is usually the pace of instruction that most often varies. The content is still fixed in most cases, as is the method (predominantly via the Internet).

Individualized Instruction and CAI: Computers are very useful for individualizing instruction. In ordinary classroom with one teacher, it is difficult or impossible for the teacher to respond to each student, to give feedback immediately, to be aware of each student's progress, problems, and weaknesses, making it difficult for individualized instruction to be effective. Computer programs have become very sophisticated and flexible. They can control the presentation of the materials according to the program. Computers can be a resource for studying, research and communication. They can be connected to databases, and students can get various types of information from the databases. Computers can keep records of scores, time spent on the computer, and the files students have worked on. Students can see the results of their work. Teachers can also see what individual students and entire classes are doing. They can use this information to determine the course of future instruction and see the problems that students are having.

There were many anticipated benefits to using the computer to deliver instruction, in practice; CAI has been heavily criticized for its hidden side-effects. These are nicely articulated by Henry F. Olds:

Learning is in control of some unknown source that determines almost all aspects of the interactive process. To learn one must suspend all normal forms of interaction and engage only in those called for by the program. Learning is an isolated activity to be carried on primarily in a one-to-one interaction with the computer. Normal inter-human dialogue is to be suspended while learning with the computer. Learning involves understanding (psyching out) how the program expects one to behave and adapting one's behavior accordingly. One must suspend idiosyncratic behavior. Learning (even in highly sophisticated, branching programs) is a linear, step-by-step process. In learning from the computer, one must suspend creative insights, intuitions, cognitive leaps, and other nonlinear mental phenomena. (p. 9) Olds even offered some solutions to these problems, indicating that "time on-line needs to be mixed with plenty of opportunities for human interaction" and that computer should allow people to "jump around within the program structure" (p. 9).

CAI became the forerunner in individualized instruction during the 1980s and early 1990s, as the home computer became more powerful and less expensive. The changes that the computer environment helped to make were predominantly a change in the delivery mechanism of individualized instruction, rather than a fundamental change in purpose or method. In a sense, the computer, especially the home computer, offered a convenience that other delivery mechanisms lacked. This convenience was accelerated with the proliferation of the Internet in late 1990s. Starting as an extension of computer-based instruction, online education became increasingly popular and eventually began to supplant CAI as the predominant form of individualized instruction.

Advantages of Individualized Instruction: Each student learns according to his/her needs, interests, learning styles, and at his/her own pace. If materials are systematized, each student can study only the materials that are appropriate for his/her goals, etc., and can get the most benefit with the least effort and time. Students do not sit passively in class but actively participate in learning. They can get hints and feedback from the computer as necessary. Giving immediate feedback is an important aspect of computer assisted instruction, since it allows students to evaluate their answers while the questions are fresh in their minds. It helps prevent them from repeating the same mistakes until they get teacher feedback. They can understand how well they are doing and what they have achieved. They can study as much as they want, depending on the availability of the computer. Students can evaluate themselves, find their weaknesses, and work on them.

Disadvantages of Individualized Instruction: Individualized CAI is much economical and more practical, although it still requires facilities, materials, equipment, personal, etc., and it is complicated to administer (Olsen, 1980). All in all individualized CAI is much more economical than one-on-one individualized instruction, but it is still much more expensive than ordinary education. it is also necessary to train teachers to teach individualized CAI courses and make manuals for them to carry on classes. If teachers expect that computers will do all their work, the classes will not be successful.

DISCUSSION

Individualized instruction comes in many forms, all of which seek to improve instruction in some way.

As can be seen in the examples above, alternative instructional approaches most often vary the pace and method of instruction, but not the content itself. The content is usually consistent with traditional instruction, although it may be segmented differently.

Other benefits are also significant, but not as consistent among approaches. Each approach has its own set of prescriptions, and each has been heavily criticized - yet that is to be expected. Even now, individualized instruction in its various forms is still a relatively recent innovation, and will remain under scrutiny until several criticisms are accounted for.

Perhaps the most profound criticism comes in the article "Individualization: The Hidden Agenda," by Ronald T. Hyman. He was concerned with the latent functions of individualization generally. In the push for individualization, the most common approach is to divide the subject matter up into segments and teach it at a self-taught level, but Hyman warns that "Segmented Junk Is Still Junk" (p. 414). There is no concern for what really is the problem, and that is the subject matter itself. He claims that individualized instruction typically does not alter the subject matter based on the needs of the student. Without doing this, there is a compromise of individualized instruction.

In summary, individualized instruction has the potential to improve instruction by varying the pace of instruction, the instructional method, and the content. Most approaches allow for self-pacing, yet variation in method and content is rare, and when it does occur, is usually very limited. As of the early twenty-first century, there are no indications that this trend will change in the immediate future, although as the research base in this area increases, major improvements are certain to come.

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