Progress Testing in Undergraduate Medical Education

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Abstract
Progress testing is a comprehensive type of testing that measures the level of knowledge gained by medical students, especially those whose curricula incorporate problem-based learning system. Progress testing involves simultaneously administering tests consisting of identical questions to all student classes at certain intervals throughout an academic year. These tests record the individual progress of students. Progress tests may consist of multiple-choice, short-answer, and open-ended questions randomly selected from an exhaustive question bank. The tests aim to observe the progress of each student through the curriculum, giving them feedback, and evaluating the entire learning process. Progress testing is a comprehensive, longitudinal type of testing offering unique opportunities for those evaluating educational programs.

Keywords
Progress Testing; Undergraduate Medical Education; Problem-Based Learning; Program Evaluation, Deep Learning

Özet

Anahtar Kelimeler
Gelişim Sınavı; Mezuniyet Öncesi Tıp Eğitimi; Probleme Dayalı Öğrenme; Program Değerlendirmesi; Derinlemesine Öğrenme
Introduction

Progress testing

In the 1960s medical faculties in North America, the Nether-
lands, and Australia started using curricula that adopt, as an
alternative to the conventional curriculum, a number of meth-
ods such as problem-based learning, self-directed learning,
critical thinking, and self-assessment. These methods promote
deep learning rather than rote learning [1-3]. The new curricula
incorporate the central concepts of Malcolm Knowles’s adult
learning theory and humanistic approaches into medical edu-
cation, and promote new strategies and convenient evaluation
methods for knowledge testing [4]. Progress testing is a type of
testing that measures the level of knowledge gained by medical
students, especially those whose curricula incorporate problem-
based learning system. Developed concurrently by the Univer-
sity of Missouri Kansas City School of Medicine and Limburg-
Maastricht University, progress testing is a useful, exhaustive,
and longitudinal knowledge testing approach that offers both
formative and summative assessment of the knowledge gained
by the student throughout an entire academic year. Progress
testing is becoming increasingly popular throughout the world
[5-6]. It has also been employed at some medical faculties
where the problem-based learning method cannot be used [7].
With progress testing, the progress of each student is observed
throughout their undergraduate medical education program.
They receive feedback and the entire learning process is evalu-
ated. This comprehensive type of testing offers unique opportu-
nities for those evaluating educational programs [5]. Progress
tests, especially those employing multiple-choice questions,
have in recent years been in use in all continents except Ant-
tarctica. They are used in South Africa, Asia, various countries
in Europe, the Middle East, North and South America, New Zea-
land and Australia [8]. The evidence obtained from countries
such as the United Kingdom, Canada, and the Netherlands has
revealed that progress testing offers unrivaled opportunities in
measuring the increase in knowledge and the effectiveness of
this knowledge gained by students throughout their educational
program [9].

Progress testing examines functional knowledge and assesses
objectives at the conclusion of medical education

Progress testing is an extensive assessment tool for analyz-
ing not only progress with respect to learning objectives at the
end of an undergraduate medical education, but also their func-
tional knowledge of all medical disciplines and the entire learn-
ing process. Progress tests are administered throughout the
students’ medical education at certain intervals (2 to 4 times)
throughout a year; all students in all classes take the test si-
multaneously [10]. Progress tests record the increase in student
knowledge and personal development, thus offering feedback to
program evaluators [11]. Progress testing is a comprehensive
type of testing that consists of random questions from an ex-
haustive question bank (multiple-choice, true-false, open-ended
questions), intended to evaluate the entire learning process.
Questions are also specifically designed to measure functional
knowledge, in line with the learning objectives that are required
for medical students to complete the undergraduate program.
Functional knowledge refers to the knowledge that students
can both use in their medical practices and associate with such
practices after their undergraduate education [12]. In progress
tests, students are responsible for the learning process up to
the date of test; they are expected to increase their success
rates every year. Progress testing is a versatile type of testing
whereby levels of students in different stages are compared to
each other (cross-sectional) and the performance of individuals
can be observed at regular intervals (longitudinal) [8,13].
The information regarding progress testing in various countries
and universities around the world is given in Table 1 [8].

The effect of progress testing on learning

The learning approach employed can be a motivation factor in
students’ achievement of desired learning objectives, and also
a qualitative and quantitative determinant of learning. The
learning approach is affected by the content of the education
program, the teaching strategies, and the assessment/evalua-
tion methods [14]. There are three distinct approaches to stu-
dent learning [15]. The surface learning approach stems from
extrinsic motivations. Features include students’ rote learning
excessive workload, time pressure, and fear of failure. Using
this approach, students have difficulty in understanding and
making sense of new information. They have no strategy other
than memorizing the information in order to fulfill the require-
ments of the course, and their learning experience is hampered
by stress and anxiety [16]. In surface learning, students try to
learn without understanding [14,17]. By contrast, when using
the deep learning approach, students endeavor to create a
meaningful whole from individual concepts. Students try to es-

tablish a meaningful link between old and new information, and
scrutinize the relationship between evidence and results from
a critical perspective [18,19]. The strategic learning approach
is another approach in which students’ motivations in learning
are determined by their desire to become more successful [20].
Available evidence supports the undisputed positive impact of
progress tests on the deep learning of students [12]. Progress
testing at McMaster University has allowed students who are
preparing for the national licensing examinations to create a
continuous study strategy and to achieve a better level of knowl-
edge [13]. In addition to its positive effect on gaining medical
knowledge, progress testing also contributes to the growth of
functional knowledge as compared to a baseline of the first
year of medical education [21]. Progress testing also increases
medical knowledge when applied as a formative assessment at
some medical faculties where problem-based learning and an
integrated education program are not available [22].

How is a progress test prepared?

A progress test can be prepared by using the table of specifica-
tions in accordance with the competencies expected at the end
of an education program and with all the learning objectives.
Organ systems are taken as the basis in the design phase of the
test [23]. At another stage in the preparation of the test, tables
can be used to prevent representation of different disciplines
(Internal Medicine, Pathology, Physiology, Anatomy, Pediatrics,
etc.). This also facilitates evaluation and suitable feedback for
conventional education programs [24]. Additionally, a classi-
fication table for predetermined content can be used to pre-
pare each test. The table columns may include organ systems
(respiratory, musculoskeletal, circulatory, etc.) and/or a variety
of skills (diagnosis, treatment, etc.) with the table rows corre-
sponding to different medical disciplines (surgery, physiology,
pharmacology, etc.) or processes (the foundation of medicine,
virulence, etc.) [23]. Also, the number of questions can be de-
termined on the basis of the row-column combinations of test
content in each cell of the table, so that it can be seen from the
table how many questions were asked about which organ sys-
tem and which discipline. Such a table can help determine repre-
Progress Testing in Medical Education

Advantages of progress testing [8,12,25,26]
- Progress testing focuses on learning: One of the most remarkable advantages of progress testing is that it breaks the detrimental association of learning as something done only when studying for exams.
- Progress testing contributes to deep learning and long-term gain of knowledge: The comprehensive information network that is essential for meeting the required objectives at the end of the undergraduate medical education is assessed by repeated progress tests. Students are not required to specially prepare for a single test. This instead enables them to acquire new knowledge by continually combining the knowledge they have gained throughout their prior undergraduate medical education with new knowledge. This helps students adopt studying strategies to become successful at exams, that is, employing the deep learning strategy rather than surface learning. Thus, a contribution will be made to the long-term accumulation of knowledge. Figures 1 and 2 show a comparison of correct answers given by medical students in progress tests.
- Progress testing provides a rich source of knowledge: Progress tests are a way to provide unique, rich and comprehensive sources of knowledge both for students and program evaluators in undergraduate medical education. Tables of specifications used in the preparation of tests (organ system, discipline-based) and computer-aided software that can be used in the evaluation of the tests provide students with detailed feedback regarding what they need to learn and in which subject areas they can improve.
- Progress testing offers an opportunity for comparison: Progress testing offers unique opportunities to compare different medical schools and curricula.
- Progress testing eliminates the need for make-up examinations: Each progress test applied provides an opportunity to record the gradual increase of knowledge.
- Progress testing helps identify students with high performance: Progress testing gives students opportunities to improve their performance in the undergraduate medical education program. In addition, progress tests can show the performance of...
Disadvantages of progress testing [27,28,29,30]

The disadvantages of progress testing include the requirement to create a source for preparation, grading of progress tests, for creation of outputs, and the requirement to ensure security during test administration. For progress tests, it is more complicated to set the standards of tests and to reduce fluctuations in the degree of difficulty of test questions. The process of planning, creating, and evaluating the progress tests entails a systematic structure. It requires considerable effort to create and regularly update question banks accordingly. Progress tests are found to be difficult, especially by first year medical students. Also, difficulties may arise in comparisons between such students.

Table 2: Exemplary table of specifications prepared for progress testing (The table does not include all disciplines)

<table>
<thead>
<tr>
<th>Department</th>
<th>General medicine</th>
<th>Cell</th>
<th>Respiratory system</th>
<th>Circulatory system</th>
<th>Digestive system</th>
<th>Nervous system</th>
<th>Reproductive system</th>
<th>Musculo-skeletal system</th>
<th>Hemic system</th>
<th>Sensory system</th>
<th>Immune system</th>
<th>Psychological system</th>
<th>Total number of questions</th>
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Figure 2: A comparison of the net number of answers (obtained by subtracting 1/4 of the number of incorrect answers from the number of correct answers) given by 4th, 5th and 6th grade medical students

Figure 3: A comparison of the net number of answers given by a 5th grade medical student in his/her own class and in the entire medical school
Conclusion

Progress tests offer a way to test the influence area of the knowledge, which is a requirement for medical students to complete their courses in an undergraduate medical education program. Progress testing records changes in students’ increasing levels of knowledge throughout the course of their undergraduate medical education and gives feedback to both program evaluators and students, thus providing a detailed analysis of their individual progress. In addition to providing a rich source of information, progress tests also offer a unique opportunity to evaluate undergraduate medical education, due to their cross-sectional and longitudinal design. With successive tests applied, students are encouraged to maintain their acquired knowledge for a long period of time. Progress tests are an opportunity to have discussions with students about the courses in which they have shown progress and those in which they may have insufficient knowledge.

Competing interests

The authors declare that they have no competing interests.

References


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