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INVESTIGATION THE ALIGNMENT BETWEEN SCHOOL LEARNING AND ENTRANCE EXAMINATIONS THROUGH ITEM ANALYSIS

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Abstract. *This study presents findings collected from an analysis of Turkish Biology Curriculum Guidelines and of their alignment with the curricular outcomes and the Student Selection Examination (SSE) for higher education. The analysis was performed in multiple dimensions: content areas, learning outcomes in terms of scientific research and process skills (SRPS), science-technology-society-environment (STSE), communication competencies, attitudes and values (CCAV) and cognitive objectives. Webb's (2007) alignment criteria were used to investigate the relationship between curriculum standards and assessment frameworks. In this process, the biology questions asked in the 2010 SSE were examined in detail by 10 biology teachers who have been teaching biology courses at secondary schools. Although alignment consistency was high according to the depth-of-knowledge (DOK) consistency and categorical concurrence criteria, the SSE questions and curriculum outcomes were not fully aligned considering the low consistency of range of knowledge and balance of representation criteria.*

Key words: *assessment framework, curriculum alignment, large-scale examination; standard-based curriculum.*

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Introduction

The right to acquire a qualified higher education that can enhance chance for employment or realize carrier hopes requires being intellectually elite proven by strong competitive effort in college and university entrance exams because of the limited quota of the higher education programs (IHEP, 1998; Porter, 2002). Colleges and universities all around the world use a variety of classification indicators of pre-collegiate academic success to decide which applicants should be accepted to university-level programs (OECD, 2007; IAU, 2009). Standardised admission test scores, such as the SAT, ACT, Math and SAT Verbal scores, measures high school academic performance (e.g., high school grade point average 'GPA' or percentile rank), matriculation or exit exam scores, student essays, letters of recommendations, initial letters, formal interviews, foreign language proficiency scores for instance TOEFL, IELTS scores, and subject-specific test scores (e.g., Advanced Placement 'AP' tests in chemistry, biology, languages, etc.) have been used alone or combined with each other to create a selection index in which higher scores relate to higher levels of academic preparation and a greater likelihood of admittance (Culpepper & Davenport, 2009; Hambleton et al., 2009; Jang, & Roussos, 2007; Koys, 2010; Liang & Yuan, 2008; Luisa & Canado, 2010; Sohn & Ju, 2010; Zwick & Green, 2007). In Turkey, the combination of the Student Selection Examination (SSE) (which corresponds to a standardised test score) and the Secondary Education Weighted Achievement Point (SEWAP) (which corresponds to GPA scores) have been used to decide which students are eligible for certain high school programs through a system called the Student Selection and Placement System (SSPS) (SSPC, 2009a). Indeed, these and indicators reflect the degree of student achievement described in national educational curricular documents.

During the last decade, the realisation of the precollege education reform movement has occupied the top place in Turkey's educational agenda, including the development of secondary school biology education curricula and associated instructional materials (MoNE, 2009). The efforts for nationwide expansion and implementation were contemplated after a small-scale piloting of new instructional resources and are currently underway. To date, new national textbooks and other curricular materials have been developed for the elementary grades (between the age of 8 and 15). The development of textbooks and associated materials for the high school level is in the last phase of planning and/or development. Along with the revision of the curricula, the structure of central examinations are also expected to be modified to align with the assessment frameworks defined in the curriculum, which describe what students are expected to know or be able to do (Liu & Fulmer, 2008; Nasstrom & Henriksson, 2008; Sahin-Pekmez & Taskin-Can, 2007; Topcu & Sahin-Pekmez, 2009; Vos & Bos, 2005). The aim of this study was to investigate the relationship between assessment frameworks and curriculum standards.

After nearly every curricular reform movement, a large number of research studies have examined the alignment of curriculum and assessment policies (e.g., Anderson, 2002; Brown, & Conley, 2007; Fulmer, 2010; Liu & Fulmer, 2008; McDonald & Van Der Horst, 2007; Osta, 2007; Saderholm & Tretter, 2008; Sireci et al., 2009; Yan & Erduran, 2009). Among these studies, research on the curricular alignment of large-scale examinations comprises a much smaller body of literature (e.g., D'Agostino & Bonner, 2009; Liang & Yuan, 2008; Liu, & Fulmer, 2008; Vos & Bos, 2005). Because the context of these studies is specific to the country under discussion, Turkey's educational, social, and cultural variability necessitates research that regards the educational reflections of this diversity. Thus, these peculiar features make central educational assessment procedures not only indispensible but also influential and deeply affective.

Secondary education in Turkey is somewhat distinctive. There are two main categories of high schools. General high schools aim to prepare students for university education, while vocational and technical high schools aim to equip students with job skills and place a lower emphasis on general education than do general high schools. Even within some types of schools, grade 10 students choose to enrol in different streams, which each place more emphasis on one subject than on another (e.g., science versus literature) (MoNE, 2009). However school types differ, the Ministry of National Education (MoNE) determines the curriculum and sets standards for all elementary and secondary schools part of the centralised education system. The MoNE is responsible for all educational services including policy decisions, curricula, the approval of textbooks and other instructional materials, governance and inspection of schools, hiring teachers, paying salaries and the maintenance of elementary and secondary schools. Student assessment is largely influenced by the curriculum guidelines produced by the Presidency of Teaching and Training Board (PTTB), and the textbooks used are published by the MoNE. The MoNE controls what is taught in schools by specifying the curriculum and approving the textbooks that can be used in the classrooms. As a consequence, student populations, levels of interest and attitudes toward science, and the rigours of science requirements and expectations are remarkably varied in the different types of high schools (OECD, 2007; Yildirim, 2004).

Therefore, the unique cultural and educational contexts in Turkey, coupled with the enormous weight placed on large-scale examinations in relation to the development of new curricular materials for high school students, warrant an investigation of the alignment between large-scale examinations and the student learning at school. However, large scale examinations have examined only in unpublished, small-scale, Master's-level theses in Turkey (Azar, 2010; Cetinkaya, 2009; Güzel, 2006; Coban, Aktas & Sulun, 2006; Kadayifci, 2007; Sesli, 2007; Uygun, 2008).

In general, this study aims to analyse the content areas of the specified behaviours of curriculum for the 9th–12th grade (between the age of 16 and 19) and to investigate alignments of the SSE questions with the content and standards of the curriculum. For the purposes of this study, biology questions posed in the 2010 SSE booklets were analysed with respect to the standards of 2008 biology teaching program for 9th–12th graders, which covered cognitive objectives and SRPS, STSE, and CCAV behaviours. The questions that guided the study were: (a) what are the specified outcomes of the biology curriculum as cognitive objectives and SRPS, STSE, CCAV behaviours with respect to the content areas? (b) What is the distribution of the SSE biology questions according to the chapters and learning areas of the curriculum? (c) What are the in-service biology teachers' judgments about the alignment between curriculum

standards and the biology questions of SSE according to the Webb's (2007) alignment criteria?

The 2008 Secondary Education 9th-12th Grade Biology Lesson Teaching Program

The vision of the program is to create biology literate students with the assumption that everyone can be successful at biology and enjoy learning. The program is composed of units that comprise the objectives directed to concept, principle and theory as well as objectives directed to competence, comprehension, attitude and value. The fundamental concepts in units related to 'Cell, Organism and Metabolism', 'Biological Diversity, Genetics and Evolution, and 'Environment and Humans' in 9th through 12th grades are reflective of the subject content moving in parallel with learning concepts. All of the cognitive objectives are written with accompanying SRPS, STSE or CCAV behaviours in the biology teaching program. For example, the outcome of an assignment for 10th graders is described in the program as follows: *'Students show the basic parts of a seed-bearing plant on a diagram (STSE 15; SRPS 26)'* (PTTB, 2008).

Student Selection Examination for Higher Education

Every year approximately 1.5 million applicants (3% of the total population) take the entrance examinations to identify whether they are eligible for college or university programs in Turkey. The first stage of the SSE (SSE-1) is defined as 'tests related to common subjects' (SSPC, 2009b). In Turkey, beginning from the second year of high school (10th grade), students select fields of study rendered as science-mathematics, Turkish-mathematics, and Turkish-social. In the 9th grade, all of the students are given identical types of courses to the above-mentioned as common subjects. With respect to these subjects, SSE-1 consists of four different tests: Turkish (Tur), Social Sciences (Soc-1), Mathematics (Math-1) and Science (Sci-1). All of the candidates were expected to answer SSE-1 questions.

Unlike in the first stage, there are 'tests related to field subjects' in the second stage of the SSE (SSE-2) that cover the whole secondary school curricula (SSPC, 2009b). SSE-2 is made up of four different tests: Literature-Social Sciences (Lit-Soc), Social Sciences-2 (Soc-2), Mathematics-2 (Math-2) and Science-2 (Sci-2). Candidates who would answer SSE-2 questions chose which tests were appropriate for them according to their school type, fields of study and the higher education programs to which they wanted to apply. All of the questions in the exam booklet were multiple choice questions that presented five alternatives. The total time allowed to complete the test is three hours and fifteen minutes for all.

Methodology of Research

Design of Research

A document analysis method was used to analyse the process of the behaviours in the Biology Teaching Program (PTTB, 2008). To address the first research question of this study, the outcomes of the program were examined in detail regarding content areas. Numbers of listed outcomes under the standards of each chapter were determined to calculate the total numbers and percentages of cognitive objectives and SRPS, STSE, CCAV behaviours. Correspondingly, the SSE biology questions were examined in order to identify the alignment with the curriculum standards.

Sample of Research

Biology questions were reviewed by in-service biology teachers to investigate the conformity between standards and questions. The reviews were conducted with 10 biology teachers (60% female) working at secondary schools in the central part of the Trabzon province in Turkey. All of the reviewers were university graduates with a major degree in biological science, and most were experienced biology teachers with around 10 years of teaching experience.

Procedure

The reviewers were provided with multiple choice SSE biology questions and biology curriculum objectives and recommended to complete the following four steps: **relate** class, unit, standard and objective with each question; **identify** the degree of convenience as compatible, partially compatible and weakly compatible between each biology question and the related objective along with the indicated STSE, SRSP, and CCAV if they are provided; **explain** what sort of content, skills and objectives are necessary to solve the biology questions; **identify** the relationship between the biology question and one of the related objective(s) under the standard. The reviewers followed the steps one by one for each of the SSE biology questions. The reviews lasted between 45–60 minutes.

Data Analysis

The collected data were analysed according to the criteria of the accepted alignment analysis model. Explanation of the model and the complete procedure of the study to fulfil the requirements for each criterion are summarised below.

1. Categorical Concurrence Criterion: This criterion provides general information about whether the items included in the assessment measure the content regarding each standard. Normally, items placed in a test are expected to cover all of the standards. The SSE questions were analysed to determine whether the items measured the content from each standard. In this process, hits from each reviewer (provided by directly linking each biology question with its objectives) were coded to represent whether a match was found between the question and the objective(s) of the new biology program. The acceptable agreement coefficient was identified at least 0.63 by using a procedure developed by Subkoviak (1988).

2. Depth-of-Knowledge (DOK) Consistency Criterion: DOK consistency criterion enables researchers to indicate cognitively what is elicited from students during the assessment processes and what they are expected to know or do as stated in the standards. The meaning of DOK consistency for the biology curriculum represents the degree of compatibility between the SSE questions and cognitive objectives and SRPS, STSE, CCAV behaviours listed under the standards (Webb, 2007). The reviewers compared all of the objectives under the standards with the SSE questions according to the cognitive process dimensions. The minimal acceptable level adopted as 50% among the questions coded to the standard below, at, or above the DOK level (Webb, 2007).

3. Range of Knowledge Correspondence Criterion: This criterion mainly allows a concentrated comparison between appropriate breadth of coverage for a standard and the knowledge span of the standard(s) that students are required to answer correctly for the assessment items. The corresponding assessment items are expected to have at least 50% knowledge of correspondence for a minimal acceptable breadth of coverage (Webb, 2007). Therefore, 'full compliance' represents 50% or above, 'partially compliance' represents from 40% to 49% and 'incompliance' represents less than 40%. Judgments of the reviewers were examined concerning the depth and range of knowledge given in the objectives and whether these were adequate to the depth of knowledge required for students to answer the questions correctly. Moreover, the reviewers' interpretations about what is required to solve the questions were analysed to enrich the quantitative data with qualitative findings in detail.

4. Balance of Representation Criterion: Although the first three criteria enable us to judge the alignments of curriculum standards and assessments from many dimensions, they do not have any implication on how the questions are distributed among the objectives. The balance of representation criterion is used to indicate the degree to which an objective is given more emphasis on the assessment than another. An index is used to evaluate the distribution of items for each standard (Webb, 20007). To fulfil this criterion, the reviewers' comparisons were coded for the index to decide which SSE question belonged to which objective(s) under the standard for all chapters of the new biology curriculum. In this index, 'inacceptable' indicates an index value below 0.60; 'partially acceptable' indicated an index value of 0.60 to 0.69 and 'acceptable' indicated an index value more than 0.70. Balance index formula and meanings of the symbols placed in the formula identified as,

$$\text{Balance Index (BI)} = 1 - \left(\sum_{k=1}^{O} \left| 1 / (O) - I (k) / (H) \right|\right) / 2$$

Where O = Total number of objectives hit for the standard,
I (k) = Number of items hit corresponding to objective (k),
H = Total number of items hit for the standard.

Results of Research

In the first part of the study, the objectives listed below the standards belonging to new Biology Curriculum Programs were categorised as cognitive objectives and SRPS, STSE, CCAV behaviours and given below. In the second part of the study, data obtained from the alignment studies are given in detail.

Findings Related to the Biology Curriculum Programs (9th–12th)

At the beginning, the researchers analysed the curriculum regarding outcomes (cognitive, SRPS, STSE and CCAV) chapter based for each grade (9th–12th) from the curriculum guidelines.

Table 1. Distribution of the objective in biology curriculum.

Grades-Chapters	Cognitive	SRPS	STSE	CCAV
9.1. Cell, organism, and metabolism	8	7	11	-
9.2. Classification of living things and biological diversity	16	7	10	-
9.3. Conscious person – Livable environment	7	6	12	11
9th grade total	31	10	23	11
10.1. Energy conversion in living things	14	4	6	-
10.2. Cell division and reproduction	12	3	14	-
10.3. Ecology of ecosystem	8	3	10	-
10th grade total	34	5	23	-
11.1. Plant biology	27	4	3	-
11.2. Genetic, genetic engineering, and biotechnology	20	4	19	-
11.3. Community and population ecology	10	7	10	-
11th grade total	57	9	25	-
12.1. Animal biology and human	47	4	5	-
12.2. Origin of life and evolution	5	5	11	-
12.3. Protection of environment and rehabilitation	8	1	7	-
12th grade total	60	8	17	-

Findings from the percentage distribution of the cognitive objectives and SRPS, STSE, CCAV behaviours in the curriculum guidelines were showed that CCAV behaviours remain limited only in one chapter at the 9th grade level. The cognitive objectives mainly dominate the entire curriculum in an increasing manner from 9th grade through 12th grade. SRPS and STSE behaviours cover the rest of the curriculum objectives. Although the percentages of STSE behaviours are higher than the percentages of SRPS behaviours, both percentages decrease from 9th grade through 12th grade with a fluctuation at the 10th grade level.

Analysis of SSE Biology Questions

Findings regarding the analysis of 2010 SSE biology questions are given in this section. There were 10 questions asked in each of the Sci-1 and Sci-2 sections (see Appendix). The dispersion of these questions according to the chapters and learning areas are given in the following table.

Table 2. The dispersion of the 2010 SEE questions according to learning areas and chapters.

Learning Areas	Grades-Chapters	Sci-1		Sci-2	
		N	%	N	%
Cell, organism, and metabolism	9.1. Cell, organism, and metabolism	3	30	-	-
	10.1. Energy conversion in living things	-	-	1	10
	11.1. Plant biology	2	20	1	10
	12.1. Animal biology and human	-	-	3	30
Biologic Diversity, Genetic, and Evolution	9.2. Classification of living things and biological diversity	2	20	-	-
	10.2. Cell division and reproduction	1	10	-	-
	11.2. Genetic, genetic engineering, and biotechnology	1	10	2	20
	12.2. Origin of life and evolution	-	-	1	10
Environment and Human	9.3. Conscious person – Livable environment	-	-	-	-
	10.3. Ecology of ecosystem	-	-	-	-
	11.3. Community and population ecology	1	10	2	20
	12.3. Protection and rehabilitation of environment	-	-	-	-
	Total	**10**	**100**	**10**	**100**

When the biology questions examined according to learning areas at the Biology curriculum program, half of the questions were asked from the 'Cell, Organism, and Metabolism' learning area, 35% of the questions were asked from the 'Biological Diversity, Genetics, and Evolution' learning area, and 15% of the questions were asked from the 'Environment and Humans' learning area.

The Sci-1 test was expected to cover common subject areas – in other words, the 9th grade level. However, only half of the biology questions were asked at this level. The rest of the Sci-1 biology questions were taken from the 11th grade level (40%) and the 10th grade level (10%). The Sci-2 test was expected to cover field subject areas – in other words, the 10th, 11th and 12th grade level. According to our examination, 50% of the questions were taken from the 11th grade level, 10% of the questions were taken from the 10th grade level and 40% of the questions were taken from the 12th grade level. Finally, none of the questions were taken from the 'Conscious person – liveable environment' chapter at the 9th grade level that the Sci-1 test was expected to cover; none from the chapters of 'Cell division and reproduction' and 'Ecology of ecosystem' at the 10th grade level and none from the 'Protection and rehabilitation of environment' chapter at the 12th grade level that the Sci-2 test was expected to cover.

Analysis of the 2010 SSE Biology Questions

In this section, alignment studies that search for the relationship between the 2010 SSE biology questions and the objectives of the biology teaching program were performed by the 10 reviewers according to the four alignment criteria.

Criterion 1: Question Analysis for Categorical Concurrence

Ten questions were asked about the 'Cell, Organism, and Metabolism' learning area. This learning area is constructed over four chapters for each grade 9th through 12th. Each chapter has a different number of standards and objectives: the 9th grade 'Cell, organism, and metabolism' chapter has two standards and eight objectives; the 10th grade 'Energy conversion in living things' chapter has two standards and 14 objectives; the 11th grade 'Plant biology' chapter has six standard and 27 objectives; and the 12th grade 'Animal biology and human' chapter has eight standard and 47 objectives. For this criterion, the reviewers firstly examined the questions and then specifically concentrated on the objectives of each standard that directly related to the SSE biology questions.

Table 3. Categorical concurrence of the SSE biology questions and the standards.

Questions	Grade, Chapter, Standard, Objective	Hits	Concurrence
Sci-1-21	9.1.1.2. Students define the organic and inorganic compounds that make the structure of living things.	0.9	*concurrent*
Sci-1-22	9.1.1.2. Students define the organic and inorganic compounds that make the structure of living things.	0.9	*concurrent*
Sci-1-23	9.1.1.4. Students explain structure of the cell and function of these structures over cell model.	0.5	*non-concurrent*
Sci-1-24	11.1.2.1. Students explain the mechanisms that enable to take water from ground and transport through the stem in plants (SRPS 26). 11.1.2.2. Students explain how the transport of photosynthesis products occurs in plants.	0.7	*concurrent*
Sci-1-25	11.1.5.2. Students explain pollination over a flower figure (STSE 15; SRPS 26).	0.8	*concurrent*
Sci-2-21	10.1.1.6. Students compare aerobic and anaerobic respiration.	0.7	*concurrent*
Sci-2-22	11.1.5.3. Students explain fertilization in seed plants (STSE 15; SRPS 26).	0.8	*concurrent*
Sci-2-24	12.1.6.7. Students explain arrival, transport, and response of the stimuli in sense organs with examples (SRPS 7, 25; STSE 7, 15).	0.8	*concurrent*
Sci-2-25	12.1.6.11. Students explain the role of investigatory and regulatory system to provide homeostasis with examples (SRPS 7).	0.4	*non-concurrent*
Sci-2-26	12.1.6.10. Students explain negative and positive feedback mechanism for hormone secretion with examples (SRPS 7, 25; STSE 15).	0.9	*concurrent*

All reviewers provided hits for all of the questions as seen in Table 3. Standard 1 in the 9th grade related to three questions, standard 5 in the 11th grade related to three questions and standard 6 in the 12th grade related to two questions hit by the reviewers. On the other hand, a question hit both standard 1 and standard 2 in the 10th grade. As a result, a total of six different standards appeared in 10 biology questions among the 18 standards placed in the 'Cell, Organism, and Metabolism' learning area. One standard in 9th grade, four standards in 11th grade, and seven standards in 12th grade, totalling 12 standards, did not take any hit. There was not an acceptable level of categorical concurrence not only between standard 1 at the 9th grade level and question sci-1-23 but also between standard 6 at the 12th grade level and sci-2-25.

Detailed investigations revealed that the sci-2-25 slightly reflects the objectives sorted along with standard 2, which related to transporting gases, and standard 3, which related to the circulatory system, at the 12th grade level. For example, objective 4 sorted along with standard 2 required students to be able to explain the transportation of gases from alveolus to tissues or from tissues to alveolus (STSE 7, 15; SRPS 7, 25). Indeed, sci-2-25 examines whether students are able to explain the role of the investigatory

and regulatory system to provide homeostasis, not whether they could explanation the transportation procedures of respiratory gases in the body. From the results, it can be concluded that the content of the examined SSE questions mostly were met with a high agreement coefficient only for the related objectives sorted along with the standards, but because of the limited number of biology questions asked in SSE, the test remains far from covering all of the standards.

Criterion 2: Question Analysis for DOK Consistency

The objectives sorted with the standards for the 'Cell, Organism, and Metabolism' learning area were compared with the SSE questions on the basis of the complexity of knowledge required by each part to fulfil this criterion. At first, distribution of the SSE biology questions were realised according to their compatibility with the objectives along with standards, units and grade levels as cognitive objectives and SRPS, STSE, CCAV behaviours. Then the DOK consistency of the SSE biology questions for the biology teaching program objectives in terms of cognitive dimension was materialised.

Table 4. Consistency of the SSE questions according to the curriculum outcomes.

Chapter	Objective	Question	Under	At	Above	Consistency
Cell, organism, and metabolism	9.1.1.2.	Sci-1-21	0.2	0.3	0.5	inconsistent
	9.1.1.2.	Sci-1-22	0.5		0.5	inconsistent
	9.1.1.4.	Sci-1-23		0.9	1.0	consistent
Energy conversion in living things	10.1.1.6.	Sci-2-21	0.1	0.7	0.2	consistent
Plant biology	11.1.2.1.	Sci-1-24		1.0		consistent
	11.1.5.2.	Sci-1-25		0.5	0.5	consistent
	11.1.5.3.	Sci-2-22	0.2	0.6	0.2	consistent
Animal biology and human	12.1.6.7.	Sci-2-24	0.2	0.6	0.2	consistent
	12.1.6.11.	Sci-2-25	0.3	0.2	0.5	inconsistent
	12.1.6.10.	Sci-2-26	0.2	0.8		consistent

From Table 4, there are seven questions within the 10 questions belonging to the 'Cell, Organism, and Metabolism' learning area that are compatible with the corresponding CCAV, STSE, SRPS and Cognitive domains of the objectives along with the standards. From these findings, it could be said that, on the basis of the complexity of knowledge demanded cognitively by the objectives along with the standards, the SSE questions were close to each other. Therefore, DOK Consistency of the seven questions was hit as '*consistent*'.

Criterion 3: Question Analysis for Range of Knowledge Correspondence

In this process, each reviewer examined the SSE biology questions and wrote down what types of knowledge or abilities students needed to know to solve these questions and what kind of objective(s) along with the standard can be given to the students. From the Table 5, it can be seen that within the 10 questions belonging to the 'Cell, Organism, and Metabolism' learning area, only four questions had acceptable knowledge correspondence about related objectives along with the standards. Reviewer explanations about objectives and questions provided rich qualitative data in the area of knowledge correspondence. Moreover, reviewers evaluated the degree of compliance for each question to support their explanations. Acceptable knowledge correspondences were observed in only for four questions as a full compliance. From these findings, it could be said that a comparable span of knowledge expected of students by the objectives along with the standards for the teaching program is not the same or correspondent to the span of knowledge that students need to correctly answer the SSE questions.

Table 5. Comparison of objectives and SSE questions according to range of knowledge.

Objective	Question	Comparison of Knowledge Requirement and Objective	%	Correspondence
9.1.1.2.	Sci-1-21	Objective mainly focused on organic and inorganic compounds in the body of biological organism. Without understanding the anabolic and catabolic reaction mechanisms in other words chemical conversions of organic and inorganic compounds it is not possible to solve the problem.	10	incompliance
9.1.1.2.	Sci-1-22	Solution of the problem requires comprehensive knowledge about enzymes. Question try to investigate enzyme concept, structure, and reaction mechanism understood with its results by students. Objective was remained too shallow for the question.	20	incompliance
9.1.1.4.	Sci-1-23	Question investigates structures and functions of organelles over a sample that foresight gaining tree dimension, becoming ready for action, and transport to the area of usage in a cell stages of a polypeptide chain to secretion instead of a cell model. Although question constructed over an abstract sample that occurs in a cell, knowing protein synthesis mechanism is clearly facilitate the solution.	40	partly compliance
11.1.2.1. 11.1.2.2.	Sci-1-24	Question was probing water transport in plants through radioactively signed hydrogen atom included to water sample and transport of photosynthesis products. Given stress on photosynthesis limited with knowledge of reactants (water) and products (sucrose) of the reaction more than the knowledge on hydrogen atoms in structure of sucrose as a product of photosynthesis reaction derived from water's hydrogen atoms.	70	full compliance
11.1.5.2.	Sci-1-25	Samples of reproduction adaptations in entomophilies listed at the answer choices by giving focus on pollination in flowering plants. There is a slight mention on adaptation concept in addition to pollination. Question neither requires any figure or model impression nor verbal or written summarization.	60	full compliance
10.1.1.6.	Sci-2-21	Students was enabled to compare ways of energy production in living organisms over muscle cells that can make oxidative phosphorylation like other somatic cells in case of oxygen existence and lactic acid fermentation in case of oxygen debt, and facultative anaerobe bacteria that can live in either the presence and absence of oxygen.	80	full compliance
11.1.5.3.	Sci-2-22	Cases occurring in flowering plants randomly enumerated starting from arrival of pollen to the stigma until formation of endosperm tissue at the choices of this question. Students can easily find true answer if they achieve to recall basic knowledge about fertilization in flowering plants.	70	full compliance
12.1.6.7.	Sci-2-24	Cognitive objective mainly focused on stimuli acceptance and transport procedures in sense organ. But, question investigates awareness of a specific feature of these organs. Given real life situations direct students to notice contribution to biology for understand life.	40	partly compliance
12.1.6.11.	Sci-2-25	The question was asked to investigate the regulatory system's supervision on respiratory system. Students expected to make comparisons among real life situations listed at the choices of this question. But given samples also required to know function and structure of circulatory, respiratory and neural system.	10	incompliance
12.1.6.10.	Sci-2-26	Whether the students explain the regulation of hormone secretion through positive and negative feedback was aimed to investigate by asking this question. From this point of view question and cognitive objective seems to be convenient. But students also need to know factors that can affect blood pressure.	40	partly compliance

Criterion 4: Question Analysis for Balance of Representation

To find how the questions asked were distributed among the objectives listed below the same standards, a balance index calculation for each question was utilised.

Table 6. Balance Index of SSE Biology Questions.

Chapter	Question	O	H	I	BI	Balance Level
Cell, organism, and metabolism	Sci-1-21	3	5	I2,3,4= 9,1,1	0.4	*unacceptable*
	Sci-1-22	2	5	I2,4= 10,1	0.4	*unacceptable*
	Sci-1-23	2	5	I1,4= 3,9	0.3	*unacceptable*
Plant biology	Sci-1-24	2	3	I1,2= 8,5	0.67	*partially*
	Sci-1-25	4	7	I1,2,3,7= 1,6,1,2	0.79	*acceptable*
Energy conversion in living things	Sci-2-21	5	6	I2,3,5,6,8= 5,1,8,4,2	0.2	*unacceptable*
Plant biology	Sci-2-22	3	7	I1,2,3= 1,3,7	0.71	*acceptable*
Animal biology and human	Sci-2-24	2	11	I6,7= 8,10	0.68	*partially*
	Sci-2-25	3	11	I2,3,4= 10,4,6	0.59	*unacceptable*
	Sci-2-26	4	11	I8,9,10,11= 2,10,4,1	0.73	*acceptable*

From Table 6, only three questions could be classified into the acceptable category for balance of representation criterion. This criterion shows that the SSE questions were not distributed equally within objectives listed below the standards. It means that some objectives were given more emphasis on the SSE questions than others. Therefore, many standards were ignored and acceptable balances were not established.

Discussions and Implications

According to the outcome analysis results of the biology teaching program, cognitive objectives are prominently emphasised. When the weight of outcomes was examined from the 9th grade level to 12th grade level, the ratio of cognitive objectives did increase from 40% to 70% (Table 1). In a teaching program, cognitive objectives provide a means to account for the subject knowledge that students acquire by the end of the learning process., Merely emphasising the cognitive objectives in this curriculum simply means that students have to continue to acquire the tremendous knowledge load As in the curricula that have previously failed (Ayas, Cepni & Akdeniz, 1993; Cepni & Cil, 2009) while all around the world education trends are rapidly changing in response to studies about induction of curriculum; active student participation opportunities; student-centred approaches in classrooms; the development of STSE, SPRS, and CCAV behaviours.

Further, SSE questions were analysed by means of only biology questions that are prepared and conducted by the SSPC. Whereas questions related to the 9th grade level common subject field were supposed to be placed in the Sci-1 test, only 50% of the biology questions on the test represented this level. On the other hand, the test did not include biology questions related to the 'Conscious person – Liveable environment' chapter at the 9th grade level, which was regarded as part of the common subject field for all students. This disparity between preparation and test may account for the lowness of the average correct response to biology questions placed in the Sci-1 test. Expecting students who did not have biology courses after 9th grade level to solve questions related to the biology subject field and then deciding eligibility for higher education programs according to the scores obtained through these questions harms the validity of the measurement. Straying from the principles identified in the published examination guide by the SSPC also deeply affects the psychology of the candidates (Tansel & Bircan, 2006).

Through the analysis of the balance between the questions and the new biology program, positive significant results were obtained regarding Categorical Concurrence Criterion. However, these results do not resemble Saderholm and Tretter (2008)'s study results for analysing similarities and differences between the assessment structures for physics and the Benchmarks for Science Literacy (Benchmarks), National Sci-

ence Education Standards (NSES), National Assessment Governing Board (NAEP) and Trends in International Mathematics and Science Study (TIMMS), which give direction to science curricula all around the world. Increasing the number of questions would barely enable the exam to cover more subjects at the same time, and also one question can cover more than one standard (Table 2). Therefore, SSPC needs to pay attention to preparing questions that relate to all program standards.

The DOK consistency analyses were revealed the coherence between the mental complexities of the SSE exam and the cognitive level of the related objective because of understand and knowledge level cognitive requirements. Liu and Fulmer (2008) stated that tests in China and Singapore require a higher level of thinking ability according to the standards, while there is a level of compliance between the examination and standards cognitive level in the United States. In this context, Turkey is similar to the US with regard to the SSE examination and its compatibility with preparation programs. However, both outcomes and questions that include low cognitive competencies negatively affect the measurement. In PISA the required evaluation skills were classified as induction, deduction, logical thinking, system-based thinking and critical thinking, which are fundamental cognitive skills (Fensham, 2009; Hatzinikita, 2008; Nentwig et al., 2009). It can be seen as a positive point that the SSE exam contains very few knowledge-level questions. Consequently, questions that assess competence at the level of analysis, evaluation, and creative cognition should be given more space in the SSE examinations.

The analyses of the Range of Knowledge Criterion correspondences were indicated that only four of 10 questions could be answered with the knowledge gained through the outcomes of the analysed learning area. In many situations, questions required more in-depth information from the acquisition expressed in the program. In this respect, the depth of knowledge stated in the standards is insufficient for students to solve the questions. These results strengthen the inclination of students to the tutors and become alienated from the school atmosphere because they feel that schools are not able to help them crack the SSE and achieve their higher education goals. As Riffert (2005) suggests, examinations have to be adapted to schools rather than adapting schools according to examinations.

Although the questions in the SSE were prepared to include standards, the balance of representation criterion was not mostly neglected among the outcomes of a particular standard. Only three of 10 examined questions investigated in this study covered a large number of outcomes. In other words, a large number of outcomes that students are expected to achieve are left out of the scope of assessment in the examination. It is believed that a coherency between curriculum and central examinations shows the importance of the curriculum and it shows how successfully students acquire the outcomes (Kjellström & Pettersson, 2005). Finally, having common characteristics between the SSE and the curriculum will contribute to the assessment and the improvement of the curriculum.

Conclusion

Superficial assessment results obtained through the analysis for the SSE questions during this study indicated that the outcomes of the teaching program had a consistency with the SSE questions. Based on these results, all decision and policy makers argue that the current SSE is valid and reliable and at the same time it reflects the nature of the current curriculum (Cepni & Cil, 2009). However, when the SSE were analysed using four alignment criteria, it was found that the questions is not fulfilling the range of knowledge and balance of representation criterions which are the measure for alignment between the curriculum and assessment. In this case, there is a strong need for the reassessment of all the SSE questions, including all subjects and tests, to reach for stronger conclusions.

Finally, it could be concluded that validity and reliability of the examination for higher education eligibility needs to be improved regarding the findings and discussions. To meet this need, the policy makers should first analyse the contents and the nature of questions asked in the central examinations. Additionally, to become successful at preparing students for international examination, all educators and researchers should be aware of the fact that the new biology teaching program should include concepts of scientific literacy, nature of science, basic science concepts, the relationships between science, technology, society and environment and the reflections of fundamental behaviours of SRPS, STSE and CCAV in practice. If students grasp all these requirements, they will be very successful at the central examinations in addition to using

the knowledge in solving daily life problems. Theoretically, this might sound possible, but how all of these advanced ideas and attainments can be put into practice will remain the main problem that must be dealt with in the near future.

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Appendix

Sample Biology Questions in 2010 Student Selection Examination

2010 - SSE / Sci-1

29. Which of the below characteristic do not seen in reptiles that is one of the vertebrate animal group?

a) Internal fertilisation
b) Dirty and clear blood mixed circulation
c) Pulmonary respiration
d) Egg laying
e) Constant body temperature

24. When a hydrogen atoms' marked water given plant grow up, marked hydrogen is encountered at sucrose in fruit.
Until this marked water molecules arrive to the fruit, passed through from structure

I. xylem,
II. root hair,
III. phloem,
IV. leave mesophyll,

in which row?

a) I – II – III – IV
b) II – I – IV – III
c) II – III – IV – I
d) III – I – II – IV
e) III – IV – II – I

2010 - SSE / Sci-2

22. In flowering plants, which of the below occasions occurs after fertilisation?

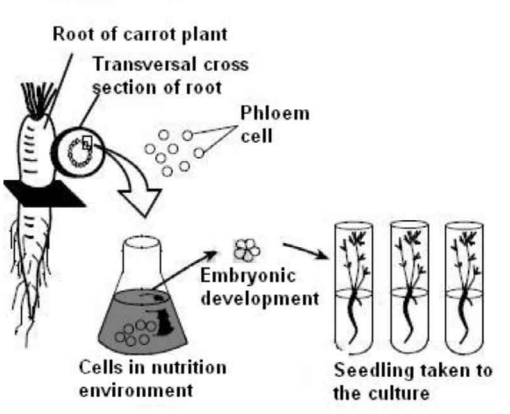
a) Pollen germination
b) Endosperm formation
c) Pollen transfer to stigma
d) Antipode cell formation
e) Reach of pollen tube to embryo sac

27. In a research, it is determined that each phloem cells taken from carrot plant root grow up to the whole plant in culture environment.
According to this research, about the obtained whole plant,

I. Cells lost some genes when they differentiated and specialised.
II. All the cells have same genes in their nucleus.
III. Plants are same with the original plants

decisions of which is/are true?

a) Only I
b) Only II
c) Only III
d) I and III
e) II and III



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