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A Curriculum Alignment Analysis: A Sample of Life Sciences Course Curriculum (2018) for 3rd-Grade Students*

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Abstract. In this study, the analytical research design is used to conduct a curriculum alignment analysis on the Life Sciences Course Curriculum (LSCC) for 3rd-grade according to Revised Bloom's Taxonomy (RBT). Objective elements were sampled from LSCC. Class instructional activities and assessment questions were taken from the Life Sciences course book for 3rd-grade students, published by Evren Publishing and approved by the Board of Education and Discipline. In this research, 29 cognitive objectives were studied in addition to 134 instructional activities and 90 assessment questions relating to those cognitive objectives. These elements were analyzed by two researchers and using RBT matrix. The findings showed that among the objectives, instructional activities and assessment questions in LSCC, there were nine objectives with complete alignment, 17 objectives in partial alignment and three objectives with misalignment.

Keywords: Curriculum alignment analysis, revised Bloom's taxonomy, life sciences course curriculum

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Introduction

Life sciences is a primary school lesson aiming at a multifaceted child development with acquisition of basic information, skills and values on social and natural sciences through a concept of integrated education to create good human beings and citizens (Gultekin, 2015; Saglam, 2015). The goal of Life Sciences Course Curriculum (LSCC) is to bring up individuals who have the life skills, who are self-aware, who live safely and healthily, who embrace the values of their community, who are environmentally conscious, who are questioning and producing and who love their country (Ministry of National Education [MoNE], 2018).

It is necessary to keep curriculum elements in harmony with each other so that LSCC can meet the goals. Objectives are the elements that should be selected as a baseline (Biggs, 2003). Learning experiences that are not in line with the objectives may not provide the desired behavioral changes in the students. Assessments lacking this quality may not provide proper feedback either to the students or teachers for the objectives on behavioral development.

It is possible to find out the consistency between the elements of a curriculum with curriculum alignment analysis. Curriculum alignment refers to a clear consistency among targeted objectives and course content to attain these objectives, learning activities, learning strategies and assessment (Harvey and Baumann, 2012). Studying such consistency can provide feedback on the applicability and efficiency of the curriculum (Bumen, 2006; Erden, 1998), and it helps observe and assess what the students have learned (Martone & Sireci, 2009) as well as opinions to carry out more efficient and more sufficient learning process (Gorin & Blanchard, 2004).

Various taxonomies can be used in curriculum alignment analysis. The original Bloom's taxonomy (OBT) is one of them (Blook, 1956). However, OBT has been revised as it includes behavioral structure, strict hierarchal classifications, one-dimensional structure and incapacity to respond to such approaches as constructivism (Anderson et al., 2001; Bekdemir & Selim, 2008; Bumen, 2006; Huitt, 2009; Kreitzer & Madaus, 1994; Marzano, 2000; Zimmerman & Schunk, 2003). Revised Bloom's Taxonomy (RBT) and its sub-dimensions (Krathwohl, 2002, pp. 214-215) are presented in Table 1.

Revised Bloom's Taxonomy (RBT) is made up of two separate dimensions known as "knowledge and cognitive process". Knowledge dimension includes four types of knowledge, such as factual, conceptual, procedural, and metacognitive. Cognitive process dimension consists of such six skills as "remember, understand, apply, analyze, evaluate, and create" (Akin and Abaci, 2011; Nasstrom, 2008; Nasstrom, 2008; Pintrich, 2004). In Turkish literature, these are mainly used in their noun forms; however, it is more accurate to use these expressions in such verb forms as "remember, understand, apply, analyze, evaluate and create" since they describe student behavior (Krathwohl, 2002). "Remember, understand and apply" are considered as basic level cognitive process skills, and "analyze, evaluate and create" are regarded as high-level cognitive process skills (Crowe, Dirks, & Wenderoth, 2008; Zoller, 1993).

Table 1.

RBT and its sub-dimensions

Knowledge Dimension	Cognitive Process Dimension
A. Factual Knowledge: The basic elements students must know to be acquainted with a discipline or solve problems. A.a. Knowledge of terminology A.b. Knowledge of specific details and elements **B. Conceptual Knowledge:** The interrelationships among the basic elements within a larger structure that enable them to function together. B.a. Knowledge of classifications and categories B.b. Knowledge of principles and generalizations B.c. Knowledge of theories, models, and structures **C. Procedural Knowledge:** How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods. C.a. Knowledge of subject-specific skills and algorithms C.b. Knowledge of subject-specific techniques and methods C.c. Knowledge of criteria for determining when to use appropriate procedures **D. Metacognitive Knowledge:** Knowledge of cognition in general, as well as awareness and knowledge of one's own cognition D.a. Strategic knowledge D.b. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge D.c. Self-knowledge	**1. Remember:** Retrieve relevant knowledge from long-term memory. 1.1. Recognize 1.2. Recall **2. Understand:** Construct meaning from instructional messages, including oral, written and graphic communication. 2.1. Interpret 2.2. Exemplify 2.3. Classify 2.4. Summarize 2.5. Infer 2.6. Compare 2.7. Explain **3. Apply:** Carry out or use a procedure in a given situation. 3.1. Execute 3.2. Implement **4. Analyze:** Break material into its constituent parts and determine how the parts relate to-one another and to an overall structure or purpose 4.1. Differentiate 4.2. Organize 4.3. Attribute **5. Evaluate:** Make judgments based on criteria and standards. 5.1. Check 5.2. Critique **6. Create:** Put elements together to form a coherent whole; reorganize into a new pattern or structure. 6.1. Generate 6.2. Plan 6.3. Produce

Source: Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into practice, 41*(4), 212-218. https://doi.org/10.1207/s15430421tip4104_2

RBT ensures clarification for OBT during the curriculum development process as it puts forward what to do with the curriculum elements in both knowledge and cognitive dimensions. Besides, it also puts a firm stamp on the relationship between the objective and the assessment (Paziotopoulos & Kroll, 2004; Bennett, 2001; Holmes, 2002; Oliver, Dobele, Greber, & Roberts, 2004), between the objective and learning experience (Airasian & Miranda, 2002) and between the learning experience and assessment elements when compared to OBT (Anderson, 2002). As a result, RBT can offer more than OBT while making a curriculum alignment analysis.

While conducting a curriculum alignment analysis based on an RBT, an RBT matrix, as seen in Table 2 is used. Every single curriculum element that needs to be studied is placed within the cell in which the horizontal and vertical dimensions intersect. During the placement, cognitive process dimension is selected for the verb in the target sentence and the knowledge dimension is selected for the nouns or noun clauses in the target sentence (Krathwohl, 2002). A ***curriculum alignment analysis*** clarifying the consistencies and inconsistencies in the curriculum is formed when all objectives, instructional activities and assessment elements for the curriculum are shown on the same table.

Table 2.

RBT Matrix

	COGNITIVE PROCESS DIMENSION					
KNOWLEDGE DIMENSION	Remember (1)	Understand (2)	Apply (3)	Analyze (4)	Evaluate (5)	Create (6)
Factual knowledge (a)	a1	a2	a3	a4	a5	a6
Conceptual knowledge (b)	b1	b2	b3	b4	b5	b6
Procedural knowledge (c)	c1	c2	c3	c4	c5	c6
Metacognitive knowledge (d)	d1	d2	d3	d4	d5	d6

In curriculum alignment analysis, objectives and instructional activities relating to these objectives (and supplementary materials) and assessment questions (e.g., performance assessments and test materials) are placed in proper cells. Later, matrices obtained from an analysis on objective, instructional activity and assessments are compared. Finally, an alignment table made up of relevant instructional activities and assessment questions are prepared for every objective. A complete alignment is formed when the objective, instructional activity and assessment elements intersect within the same cell; partial alignment occurs when the two intersects within the same cell; and when there is no intersection between the elements in any cell, it is interpreted as misalignment (Anderson, 2002; Bumen, 2006).

Complete alignment is the desirable status for the curriculums. Curriculum elements in complete alignment do not need to be modified or improved. However, the element or elements causing inconsistency must be revised properly in partial alignment so that curriculum deserves to be tried (Anderson, 2002). Curriculum's validity and efficiency are in question when a misalignment is observed (Airasian & Miranda, 2002). Hence, alignment analyses on relevant curriculums are needed to ensure the validity and efficiency of the curriculum. Therefore, LSCC is one of the curriculums that can be analysed within that scope.

In the literature, there are several studies on the overall structure and individual elements of 2018 LSCC (Aktay & Cetin, 2019; Eker, Bilgin, & Baykan, 2019; Ekmen & Demir, 2019; Esemen & Sadioglu, 2019; Gozel & Dincer, 2021; Karacaoglu, 2020; Karasu Avci & Ketenoglu Kayabasi, 2018; Yuksel & Taneri, 2020). However, these studies do not include the relations between the curriculum elements. Therefore, this study will contribute to the literature with its analysis of the mutual relations between the elements

of 2018 LSCC. Such a curriculum alignment analysis is estimated to suggest an idea on the applicability and efficiency of LSCC. Thus, it is assumed to contribute to LSCC improvement studies. Therefore, this research aims to carry out a curriculum alignment analysis on LSCC (2018) for 3rd-grade. Within this scope, the analysis aims at finding answers to the following questions:

1. What is the level of curriculum alignment among the objectives, instructional activities, and assessments for 3rd-grade LSCC (2018)?
2. What is the RBT-based distribution of objectives, instructional activities and assessment questions in 3rd-grade LSCC?

Method

Design

In this study, analytic research design was used in this research to carry out RBT-based curriculum alignment analysis on LSCC. A document sampled in the analytical research can be analyzed based on the themes set within the frameworks of various notions, cases, facts, opinions, and situations (McMillan, 2004; cited. Ersoy, 2015). In this research, LSCC and Life Sciences coursebook were studied as individual documents and an analysis carried out was based on situational themes relating to curriculum alignment (complete alignment, partial alignment and misalignment).

Data Source and Selection

In this research, a curriculum alignment analysis of LSCC was carried out according to RBT and it was limited to 3rd-grade cognitive objectives. The reason why this research was limited to cognitive objectives was that RBT was intended for the cognitive areas. Curriculum objectives, instructional activities and assessment elements relevant to the curriculum objective are all needed to conduct a curriculum alignment analysis. 3rd-grade objectives in LSCC are accessible via LSCC (MoNE, 2018) published by the Board of Education and Discipline. However, LSCC does not include instructional activities and assessment elements for such objectives. These elements are included in the Life Sciences coursebook for 3rd-grade students, published by Evren Publishing (Karabiyik, 2019), which was also digitally accessible through EIN (Educational Information Network) at the time of research. Therefore, two individual documents- LSCC and Life Sciences coursebook for 3rd-grade students were studied in this research. LSCC was studied for 29 cognitive objectives in 3rd-grade level. In Life Sciences coursebook for 3rd-grade students, 134 instructional activities and 90 assessment questions in relation to these objectives are analyzed. Instructional activities include unit warm-up questions and reinforcement exercises in the "Let's Reinforce" section present at the last pages of every unit. Assessment questions were made up of the exercises in "Let's Evaluate" section at

the final page of every unit. The unit of Healthy Life was not included in this analysis as its objectives are rather affective.

Data Analysis

Cognitive objectives in LSCC for 3rd grade, relevant instructional activities and assessment questions were analyzed by two researchers using the RBT matrix (Table 2). Since objectives were the essentials, during the analysis, all the objectives and relevant instructional activities and assessment questions were simultaneously placed into the table so that a potential ambiguity in any element was compensated by consulting to other elements. While analyzing the curriculum elements, the researchers individually encoded five objectives, 20 instructional activities and 20 assessment questions in the unit of "Life at School" in LSCC. Later on, they reunited to evaluate the analysis to discuss their point of view and disagreements so that a consensus can be reached. The remaining objectives, instructional activities and assessment questions were independently encoded and placed on the RBT matrix. After the encoding process, the inter-rater reliability was 99,60% (252/253) based on the formula "number of agreements/(number of agreements + disagreements)". As this reliability percentage is larger than 70%, encoding is considered reliable (Miles & Huberman, 1994). The researchers had a disagreement on instructional activity 1 of title "Let's Reinforce" on page 107 of the Life Sciences coursebook, and the content is shown below:

Let's Reinforce

1. Complete the mind map after brainstorming on "emergencies".

Since this is about every individual's own learning, both researchers placed this instructional activity in metacognitive subdimension (d) as RBT information dimension. However, one researcher stated that the learners only recall the information in this instructional activity and based his argument on the word "brainstorming"; hence he particularly placed this instructional activity into "remember" (1) subdimension, namely (d1), in a cognitive process dimension. The other researcher stated that the learners link the concepts scattered across their minds with the structure for the state of "emergency"

and thus claimed this instructional activity into "understand" (2) subdimension, namely (d2). The researchers consulted a third researcher with published work on RBT and by a large majority, they agreed that the instructional activity belongs to the (d2) cell. Except for this sample, there has not been any disagreement. Below is an example of how the curriculum alignment analysis is performed over an objective analyzed with one accord.

In 3rd-grade LSCC, the 5th objective in the "Safe Life" unit (LS.3.4.5) is *"He/she knows what to do and whom to ask for help when there is someone posing a threat"*. This objective included the knowledge of the relationship between the basic elements of a wide structure in the knowledge dimension so that the elements could work together. In cognitive process dimension, it required inference skills based on the relationship between the pieces of information. Therefore, it was placed as conceptual knowledge (b) in the subdimension of knowledge and as "explain" (2) in the subdimension of the cognitive process – hence (b2). The following activities were based on this objective.

Activity 1: A stranger asked to give you a lift home while you were getting back home from school. How must you respond to such a situation? Explain (b2)
Activity 2: What must you do when you meet someone posing a threat to your safety? (b2)
Activity 3: A stranger suggests taking you to an amusement park. Write what you must do under the conditions. (b2)
Activity 4: Ozan was late for school. He was supposed to be at school before his teacher went into the classroom. On his way home, a car approached him.
Stranger: I can see you are late. Get in the car, so I can take you to school fast.
• What would be a proper answer Ozan should give in such a case? Explain. (b2).
Activity 5: Write down what Ozan needs to do later. (b3)

(The fourth and the fifth instructional activities were given as a single instructional activity on the coursebook. However, they were individually analysed as their content differs from one another.) All the instructional activities were evaluated within the subdimension of conceptual knowledge (b) for the relevant LS.3.4.5 objective. In the cognitive process dimension, the first, second, third and fourth instructional activities were included in the subdimension of "understand" (2) as they included inference, explanation, and deduction from written messages and the fifth instructional activity was included in the subdimension of "apply (3)" as it required practice and performance.

Assessment questions on the same objective are presented below:

Assessment question 1: (a1)
Write whether the statements below are true (T) or false (F).
( ) We should accept help from strangers on our way to school.
Assessment question 2: (a1)

Hangi çocuğun kartındaki yazı, T.C. Aile, Çalışma ve Sosyal Hizmetler Bakanlığının okul çağındaki çocuklar için belirlediği kurallardan değildir?

Which of these students does not have a card with a rule set by the Turkish Ministry of Family, Labor and Social Services?

A. Crying out for help in difficult situations
B. Not going to deserted streets, construction areas and abandoned places
C. Opening the door for strangers while alone at home

Assessment question 3: (b2)

Görsele göre Mert, tanımadığı bu kişiye aşağıdaki cevaplardan hangisini vermelidir?

A. Çikolatayı alamam, sizinle de gelemem.
B. Teşekkür ederim. En çok sevdiğim çikolata.
C. Peki, sizinle gelirim ama çikolatayı alamam.

Your father told me to give you this chocolate. Come with me.

According to the image, how should Mert respond to this stranger?

A. I can neither take this chocolate nor ride with you.
B. Thank you. It is my favorite chocolate.
C. Ok, I'll come with you, but I cannot take this chocolate.

In terms of knowledge dimension, the first and the second assessment questions included factual knowledge (a) as they assess basic knowledge on the relevant unit and the third assessment question included conceptual knowledge (b). Concerning cognitive process dimension, the first and the second questions were based on recognition and remembrance, so it was in the subdimension of "remember" (1); and the third questions was in the subdimension of "understand" (2) as it required explanation.

Table 3 shows a curriculum alignment analysis on the 5th objective (LS.3.4.5) of the 3rd-grade LSCC Safe Life unit as well as the relevant instructional activities (ia1, ia2, ia3, ia4, ia5) and three assessment questions (aq1, aq2, aq3).

Table 3.

Curriculum Alignment Sample

Objective		Instructional activity		Assessment		Alignment type	Interpretation
Element	Cell	Element	Cell	Element	Cell		
LS.3.4.5.	B2	ia1	B2	aq1	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia1	B2	aq2	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia1	B2	aq3	B2	Complete	Three elements aligned
LS.3.4.5.	B2	ia2	B2	aq1	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia2	B2	aq2	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia2	B2	aq3	B2	Complete	Three elements aligned
LS.3.4.5.	B2	ia3	B2	aq1	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia3	B2	aq2	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia3	B2	aq3	B2	Complete	Three elements aligned
LS.3.4.5.	B2	ia4	B2	aq1	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia4	B2	aq2	A1	Partial	Two elements aligned
LS.3.4.5.	B2	ia4	B2	aq3	B2	Complete	Three elements aligned
LS.3.4.5.	B2	ia5	B3	aq1	A1	Misalignment	Three elements misaligned
LS.3.4.5.	B2	ia5	B3	aq2	A1	Misalignment	Three elements misaligned
LS.3.4.5.	B2	ia5	B3	aq3	B2	Partial	Two elements aligned

The sample pointed to a complete alignment among the first, second, third, fourth instructional activities (ia1) and the first assessment question (aq1) for LS.3.4.5 objective. Due to the availability of at least one state with complete alignment, this objective was expressed as "complete alignment". Other alignment analyses on LS.3.4.5 were not included in this evaluation concerning the alignment type of the objective.

Findings

The distribution of curriculum alignment level among such elements as objective, instructional activity, and assessment in 3rd-grade LSCC are studied, and the findings are presented in Table 4.

Table 4.

Curriculum Alignment Level among such Elements as Objective, Instructional Activity and Assessment in 3rd-grade LSCC

	LaS	LaH	SL	LiOC	LiN	Total
Complete alignment	1	2	3	2	1	9
Partial alignment	4	3	2	4	4	17
Misalignment		1	1	1		3

LaS: Life at School, LaH: Life at Home, SL: Safe Life, LiOC: Life in Our Country, LiN: Life in Nature

As shown in Table 4, there are nine objectives with complete alignment among objectives, instructional activities, and assessment questions, 17 objectives with partial alignment and three objectives with misalignment. This means that LSCC is mainly consisted of relationships with partial alignments. The number of complete alignments is relatively lower than partial alignments. In LSCC, there are relatively a small number of misalignments.

Table 5 shows the findings on the distribution of 29 cognitive objectives, 134 instructional activities and 90 assessment questions included in 3rd-grade LSCC based on the units according to RBT.

Table 5.

An RBT-Based Analysis of Objectives, Instructional Activities and Assessment Questions in 3rd-Grade LSCC

		a1	a2	a3	a6	b2	b3	b4	b6	c1	c2	c3	d2
Objectives	LaS			1		1			1			2	
	LaH					4			1			1	
	SL		1			5							
	LiOC	2	1	2			1	1					
	LiN			1		3						1	
Instructional Activities	LaS	3		1		9		1	2		1	3	
	LaH	2				27			3		2	2	
	SL	3				16	1	2	1				1
	LiOC	6		8	1	12	1	2	1				
	LiN	4		2		10			1		1	5	
Assessment Questions	LaS	14			1	3				1	1		
	LaH	10				3							
	SL	13				5							
	LiOC	15				5							
	LiN	18				1							

LaS: Life at School, LaH: Life at Home, SL: Safe Life, LiOC: Life in Our Country, LiN: Life in Nature

As shown in Table 5, it was seen that the objectives were intensified in the subdimensions of "conceptual (b) and factual (a) knowledge" and that there was none in the subdimension of "metacognitive knowledge (d)". In the cognitive process dimension, the

objectives were mostly available for the "understand (2)" subdimension and that there was none in the subdimension of "analyze (4)". The concentration of objectives was dense in "understand conceptual knowledge (b2)", "apply factual knowledge (a3), and "apply procedural knowledge (c3)". Overall, it was observed that the objectives aiming at a high level of cognitive process skills were limited.

It was seen that the instructional activities in the 3rd-grade Life Sciences coursebook were mostly for "conceptual knowledge (b)" subdimension and "metacognitive knowledge (d)" subdimension had the least. In cognitive process dimension, instructional activities were mostly present in "understand (2)" subdimension and there is none in the "evaluate (5)" subdimension. Instructional activities were mainly intense in "understand conceptual knowledge (b2)" and "remember factual knowledge (a1)". Concerning cognitive process skills, the most repeated subdimension was "understand (2)", followed by "apply (3)". It was observed that the number of instructional activities for high level cognitive skills was limited.

An analysis of the distribution of assessment questions revealed that there was a considerable portion of assessment questions in the "factual knowledge (a)" subdimension in terms of knowledge dimensions, yet there was none in "metacognitive knowledge (d)" subdimension. Most of the assessment questions are present in "remember (1)"; and there was none in subdimensions of "apply (3), analyze (4), evaluate (5) and create (6)". In general, the majority of assessment questions were found in "remember factual knowledge (a1)" and "understand conceptual knowledge (b2)".

Discussion, Result and Suggestions

Since curriculums require systematic integrity, all curriculum elements need to be consistent with one another to achieve the overall objective (Tyler, 1969). To study the consistency between the curriculum elements, it is suggested to analyze curriculum elements both individually and collectively (Erden, 1998). It is thought that such an analysis will give an opinion for the applicability of the curriculum to the practitioners, curriculum developers as well as other partners in the curriculum. The alignment among the elements of LSCC has been analyzed in this study based on RBT and curriculum elements have also been studied individually for an accurate interpretation of the analysis.

Findings suggest that LSCC does not truly project a complete alignment and that the relationship among the relevant curriculum elements is rather made up of partial alignments. This points out an inconsistency between any two elements of the curriculum, such as the objective, an instructional activity, and assessment. Such inconsistency may make LSCC challenging to apply. Concerning partial alignments, one may fail to form learning experiences relevant to the objectives if the objective and assessments are consistent with one another, yet the instructional activities are inconsistent with them. As a result, the learning process maynot be carried out effective and efficiently. There is also the possibility of making inaccurate detections about the targeted learning product and

the learning process at times of partial alignments in which objective and instructional activities are consistent and the assessment is inconsistent; which may consequently lead to challenges to achieve LSCC objectives (Bumen, 2006; Erden, 1998). Despite these unfavorable possibilities, it can be said that LSCC is a revisable curriculum since there is a certain level of complete alignment consistency and the number of misalignments is low and partial alignments is high. Once partial and misalignments are revised, the curriculum can be transformed into a more consistent, more efficient and more applicable curriculum. To transform partial alignments to complete alignments, instructional activities, or assessment questions inconsistent with the objectives might be modified for greater consistency. In the case of misalignments, both learning activities and assessment questions can be reviewed to make them consistent with the objectives and, therefore, with each other. Otherwise, it may lead to the formation of wrong ideas regarding learning type, learning experience and learner evaluation, which will be inaccurate, incomplete and will not project the student level properly.

When LSCC elements are individually studied, objectives are mostly found in the subdimension of "conceptual knowledge," and there is none in the subdimension of "metacognitive knowledge". In the cognitive process dimensions, most of the objectives are found in the subdimension of "understand" and there is none found in the subdimension of "analyze". As to the analysis on such distinctive goals in LSCC as "The student becomes familiar with himself/herself and his/her surroundings" and "He/she acquires the skills of the basic scientific process"; it is seen that these goals encompass "conceptual knowledge" defined as the knowledge of the relationship between the basic elements within a greater structure. Therefore, it can be said that the intensity of "conceptual knowledge" is meaningful in terms of achieving these goals in LSCC. However, as to the goal of "The student acquires a skill to learn how to learn", there is no metacognitive objective found in LSCC. As the subdimension of "metacognitive knowledge" is not as tangible as the other types of knowledge (Nasstrom, 2008), it is relatively more difficult to develop instructional activities and to make assessments and write objectives. Hence, it is a considerable drawback for LSCC not to have any objective representing this dimension even though the scarcity of objectives related to metacognitive learning is tolerable. The objectives of LSCC are expected to include metacognitive knowledge as well as it is prepared with a constructivist approach (Dunlop & Grabinger, 1996). Surely, such a design suggestion might be questionable as to whether it is acceptable to expect metacognitive objectives from 3rd-grade students. However, it can be said that the suggestion makes more sense after considering that children have metacognitive skills as of early childhood and they can think upon their own mental states (Schneider & Loffler, 2016; Whitebread & Neale, 2020), and they are familiar with their own learning processes as of the first grade and they are capable of resorting to various mental processes in relation to understand as of the second grade (Annevirta & Vauras, 2001).

When the objectives are studied based on the subdimension of "analyze, evaluate and create" (Zoller, 1993) known as the high-level cognitive process skills in the cognitive process dimension of RBT, it is seen that a mere three of 29 objectives can be utilized

within this scope. From this point of view, it is possible to put forward that 3rd-grade LSCC in 2018 concentrates on basic cognitive process skills and objectives for high-level cognitive process skills are not represented enough in the curriculum. A literature review reveals that other curriculum analyses carried out in primary school (Aktan, 2020; Aslan & Atik, 2018; Buyukalan Filiz & Baysal, 2019; Canguven, Oz, Binzet, & Avci, 2017; Durmus, 2017; Karip, 2019; Yolcu, 2019) are like LSCC within that respect. Although this finding is consistent with the literature review, a LSCC based on constructivist approach is supposed to support the learning of high-level cognitive process skills (Biggs, 1996; Driscoll, 1994). Like metacognitive knowledge, it is necessary to discuss whether high-level cognitive process skills should be included for the 1st, 2nd, and 3rd-grade primary school students expected to be in the concrete operational stage. Lewis and Smity (1993) claim that advanced thinking is necessary for everyone since every individual -even the ungifted children- may face various situations in their daily life that are confusing or in which they have to make decisions on what to do or what to believe. Considering that life sciences course deals with the situations related to school, family, health, security, country, and nature, it seems important that children should acquire high-level cognitive skills.

A study on curriculum elements reveals that instructional activities have the highest density among all elements. Regarding the RBT knowledge dimension, it can be said that most of these instructional activities are seen in the subdimension of "conceptual knowledge," and the least is seen in the subdimension of "metacognitive knowledge". In cognitive process dimension, instructional activities concentrate most in the subdimension of "understand" and it is seen that there is no instructional activity in the subdimension of "analyze". This finding is consistent with the findings on the analysis of LSCC objectives. The fact that instructional activities focused most on the subdimension of "understand" followed by the subdimension of "apply" is not consistent with the distribution of cognitive process dimensions in the objectives. However, given that it is natural for instructional activities to include more practices, this might be considered "tolerable" so long as it does not distort curriculum alignment. As to high-level cognitive skills, it is seen that a limited number of instructional activities requires such skills. This indicates that LSCC does not aim at high-level cognitive skills either in objectives or in instructional activities.

When assessment questions are studied for the RBT knowledge dimension, it is seen that a great majority of assessment questions are included in the subdimension of "factual knowledge", yet there is none in the subdimension of "metacognitive knowledge". In the cognitive process dimension, the questions are mostly in the subdimension of "remember" and there is no assessment question in the subdimensions of "apply", "analyze", and "evaluate". It is uncovered that assessment questions concentrate most on "remember factual knowledge (a1) as followed by "understand conceptual knowledge (b2)". "Factual knowledge" and the basic cognitive process skill "remember" are for the more complicated learning process (Mayer, 2002). However, given that most of the questions aim at "remember factual knowledge (a1)" might lead students to memorize rather than understanding (Anderson et al., 2001). The assessment questions

in "a1" and "b2" account for almost all assessment questions; therefore, it might be assumed that these questions are not enough to measure the student's different knowledge and high-level cognitive skills which are aimed to be developed by the constructive approach. In 2018 LSCC, objectives and instructional activities mainly requiring an understanding of conceptual knowledge are being tested mostly through the assessment questions aiming at remembering factual knowledge. As a result, the assessment element hinders the way to a complete alignment. Overall, it can be said that assessment element in life sciences should not be used as an element to create pressure on students (Baysal, Tezcan, & Arac, 2018). However, this does not mean that assessments to be made may lack the ability to measure objectives. Even if it is not used as a tool of pressure and grade, assessments in life sciences course are expected to provide feedback on the students' cognitive and affective behaviors.

A summary of research findings reveals five basic results. First, the complete alignment ratio of LSCC is not in the desired level; however, its partial alignment ratio is also high. The desired level in this course is to see that every single element of the curriculum has an alignment with the other relevant elements, without any exception. As suggested by Anderson (2002), this means that the barrier between consistencies of the curriculum elements is removed so that the curriculum is considered applicable. Second, assessment questions are the elements breaking the alignment in LSCC. Assessment questions try to test even the objectives and instructional activities that do not require very advanced level cognitive skills at lower levels. Thirdly, the distributions of objectives, instructional activities, and assessment questions vary concerning both knowledge and cognitive process. Assessment questions concentrate more on "remember factual knowledge", which might be interpreted as the questions are "insufficient" to test the objectives and instructional activities. The fourth result is that all three curriculum elements fail to represent metacognitive knowledge and high-level cognitive process skills. The fifth result is that there are quantitatively more instructional activities than objectives and assessment questions, which is consistent with the process-based nature of the curriculum.

Based on these research findings, curriculum development experts and publishing houses might be advised to revise the objectives, instructional activities, and assessment questions in 3rd-grade LSCC and coursebook so that the curriculum elements are consistent with one another to form a complete alignment in terms of knowledge and cognitive process dimensions. In line with constructive theory, they might be advised to include "procedural and metacognitive knowledge" in the dimension of knowledge, such high-level cognitive process skills as "analyze, evaluate, and create" in the dimension of the cognitive process while revising curriculum elements. Teachers - the practitioners of the curriculum- can be advised to be informed on RBT so that they can determine the instructional activities for the objective levels and prepare proper assessment questions. Teachers making use of LSCC as it is maybe advised to consider instructional activities more aligned with the objectives and assessment questions so that they can use a processed-based assessment method to test whether the students achieve the objectives.

This research is limited to 3rd-grade life sciences course. For additional contribution to the literature, LSCC can be analyzed for its curriculum alignments in different grades or analyses on other course curriculums might be carried out. In this research, curriculum alignment analysis has been carried out only through studying official curriculum and all the elements studied are available via the official curriculum. For further research, while objectives are sampled from the official curriculum, instructional activities and assessment approaches can be sampled from in-class instructional activities within the framework of the operational curriculum. This could provide valuable insights into the literature as the curriculum alignment between the theory and the practice might be determined.

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