

What teachers teach and how they teach it: A case study on fidelity of implementation in Turkish Cypriot schools

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Most studies on fidelity focus on adherence (how much it is done), ignoring quality of delivery (how well it is done) as a measure of implementation, and are mainly quantitative in nature. In-depth qualitative studies assessing how much and how well curricula are implemented are scarce. Drawing on data from a qualitative study, this article addresses both the adherence and the quality of delivery dimensions of a newly developed life sciences curriculum. The study also seeks to identify the factors affecting fidelity of implementation. Evaluative case study design, in which the required data were gathered through semi-structured interviews and classroom observations, was used. Sixteen primary school teachers participated in the study, and the data were analysed through thematic analysis. Findings reveal that the participating teachers focus solely on knowledge transmission while also making adaptations to the curriculum. The study highlights the striking role textbooks play in the implementation process. The findings provide strong evidence for urgent needs in organising professional development for teachers to equip them with competencies to implement the curriculum with fidelity.

Introduction

Systematic revisions and updates aim to meet the changing needs of the child and the society has necessitated the evaluation of curricula determining their effectiveness. One issue that needs to be considered during evaluation process is to find out the extent the proposed curriculum is implemented. Curriculum fidelity or fidelity of implementation (FoI) - discussed in many domains such as education, health and psychology - refers to the extent the key components that constitute a curriculum are employed as intended by the designers (Berkel et al., 2011; Bümen et al., 2014; Pence et al., 2008).

Assessing FoI is considered as a precondition that needs to be met to ensure the validity, both internal and external, of evaluations (Durlak, 1998; Durlak & DuPre, 2008) preventing incorrect inferences and conclusions about the effectiveness of a curriculum (Fisher et al., 2014). FoI can be assessed in terms of quantity (how much it is done) and quality (how well it is done). Accurate interpretation of evaluation results depends on ensuring that all components of the curriculum are delivered and they are delivered well (Haataja et al., 2014). Although there is no single method that can be used to assess FoI, five key dimensions, namely adherence, dose/duration, quality of delivery, participant responsiveness and program differentiation are mostly mentioned in the literature (Fisher et al., 2014; O'Donnell, 2008; Piasta et al., 2015). Adherence – the quantitative aspect of the implementation - refers to the extent the key components are implemented by the teachers (e.g., adherence to the objectives, content, materials, etc.). Dose/duration is the amount of time students are exposed to the curriculum. Quality of delivery refers to the

quality of implementation that includes how well teachers employ key components in alignment with the theoretical background of the curriculum. Participant responsiveness is the overall participation and enthusiasm shown to the curriculum by the children and program differentiation, is not considered as a measure of fidelity but refers to the unique set of characteristics that are essential to achieving the intended outcomes (Fisher et al., 2014; O'Donnell, 2008; Piasta et al., 2015). Depending on the scope and the aim, it is possible to focus all these dimensions to capture a holistic view or make use of one or two (Azano et al., 2011).

FoI is not an all-or-none construct but exists in degrees - from 0% to 100% - on a continuum. Research findings reveal that 100% FoI is rarely reached due to some variations, also known as adaptations in the implementation process. Variations/adaptations involve excluding/ including critical elements such as learning objectives, topics and activities caused by variables that include contextual factors, curriculum properties, resources/ technology, teacher education, and teacher characteristics (Azano et al., 2011; Cutbush et al., 2017; Dusenbury et al., 2003; Fullan, 2007; LaChausse et al., 2014; Öztürk, 2012; Yıldırım, 2003). Teacher characteristics that include teachers' knowledge, skills, beliefs and approaches play a more significant role in the implementation process compared to the others (Han, 2013). Although teachers are given the same curriculum to be used, they tend to use different approaches in implementation. While some teachers may adopt a fidelity approach, it may be possible for some others to follow an adaptation approach (Shawer, 2010).

Most studies conducted on FoI are of quantitative nature investigating the relationship between fidelity and learning outcomes to find out whether higher fidelity leads to better learning outcomes or not (Haataja et al., 2014; Piasta et al., 2015). Previous research provided evidence that high levels of fidelity leads to better learning outcomes showing that both student performance and their readiness for the next grade level are hampered unless teachers implement the curriculum with fidelity (Azano et al., 2011; Barton et al., 2017; Piasta et al., 2015; Polikoff & Porter, 2014; Yurdakul, 2011). Having vertical and horizontal alignment within the same grade level and between the preceding and following grade levels supports consistency, enhancing student achievement and preparedness for the next grade levels (Tweedie & Kim, 2015). Lack of fidelity with the curriculum hinders alignment, resulting in learning gaps as well as instructional inconsistencies among teachers (Ahmed Hersi et al., 2016; Early et al., 2014).

Although there is a common view arguing that FoI is essential in order to make best use of a high quality curriculum (Barton et al., 2017), there is also another growing view supporting teachers to have the flexibility to make the necessary adaptations to meet local conditions (Bümen et al., 2014; Durlak et al., 2011; Yazıcılar & Bümen, 2019). As Castro Superfine et al. (2015) indicated, teachers can teach more effectively if they are given the freedom to make some modifications to curricula in the implementation process. The debate between the supporters of two approaches, namely fidelity and adaptation has continued in either-or terms. Yet, despite the fact that the adaptation approach is not recommended, studies reveal that the two approaches frequently co-exist in most contexts (Cutbush et al., 2017; Durlak, 2008, Durlak & DuPre, 2008; Haataja et al., 2014). A very

recent study conducted by Tokgoz Can & Bümen (2021) demonstrated that despite having a centralised education system and very limited autonomy, teachers tend to use the adaptation approach, expecting to have a flexible curriculum in schools.

Aim of the study

Collecting data regarding an implementation process is required in curriculum evaluation studies. Moreover, there is also a need for more research to disclose how various factors affect implementation in different contexts (Durlak & DuPre, 2008). Research has displayed the equal importance of the quantity (how much it is done) as well as the quality (how well it is done) of implementation. However, most studies in the literature are of quantitative nature focusing solely on the quantitative aspect, ignoring quality as a measure of implementation (Durlak & DuPre, 2008; Haataja, 2014). Drawing on data from a qualitative study, this article fills in this gap by exploring FoI of a newly developed life sciences curriculum with regards to the *adherence* and the *quality of delivery*. Exploring the adherence and the quality of delivery dimensions would give in-depth holistic data regarding in what ways the enacted curriculum differs from the intended curriculum, and the reasons for differences, if any. In line with this aim, this study addresses the following research questions:

1. How does the enacted life sciences curriculum differ from the intended curriculum with regards to *adherence* and *quality of delivery* dimensions?
2. What are the factors that affect FoI of the life sciences curriculum?

Study context

As a result of the *Curriculum Development Project*, aimed to foster 21st century skills in students, basic curriculum that covers the five years of primary education and the first three years of secondary education was developed for the first time in North Cyprus. Before the development of the basic curriculum, the teaching of subjects at schools was based on textbooks (Ministry of National Education and Culture (MNEC), 2016a). Basic curriculum was developed by the Ministry of Education with the aim to equip pupils with 21st century skills that include problem-solving, critical thinking, entrepreneurship, creativity, effective use of technology and life-long learning skills. The curriculum is claimed to be student-centred based on constructivism that considers individual differences, making use of contemporary instructional strategies and assessment methods. In a student-centred learning environment, pupils are active participants constructing knowledge while teachers act as a guide fostering learning to learn (MNEC, 2016a). Due to the centralised education system, basic curriculum is expected to be implemented in schools without any variations.

The life sciences curriculum was developed as part of *Curriculum Development Project* and put into use in the 2016-2017 academic year. It is implemented in the first three years of primary education which is allocated as one hour (40 minutes) per day. As stated, the curriculum supports the use of various instructional strategies that include cooperative

learning, problem-based learning, project-based learning and multiple intelligences. Lectures, guided discussions, case studies and demonstrations are among the methods/techniques teachers are advised to use for implementing the curriculum. Teachers are also recommended to include pupils in the assessment and evaluation process so that they are aware of how learning takes place, focus on their strengths and weaknesses and learn how to improve their weaknesses, taking responsibility for their own learning. Therefore, besides traditional assessment tools that include multiple choice tests and matching questions, teachers are expected to use student-centred methods such as portfolios, peer and self-assessment, focusing on process as well as product of learning (MNEC, 2016b).

Method

Research design

Case study design was adopted because it is particularly useful when there is a need to gather holistic and meaningful data about real life-events through direct observation of events and interviews with the persons who are involved in those events (Yin, 2018). This is an evaluative case study that aimed to describe, explain and make a judgement in order to better understand teachers' FoI of the life sciences curriculum implemented in state schools in North Cyprus (Gerring, 2007; Guba & Lincoln, 1981).

Participants

The study group included 16 teachers teaching the subject of life sciences in state primary schools in North Cyprus. The schools were chosen randomly from a roster of state schools. The study group was selected purposefully, enabling the use of information-rich cases. Criterion sampling strategy (Patton, 2002), that allows for the selection of participants who display predetermined characteristics deemed important for the study, was used. The inclusion criteria are as follows: (1) participants must have at least five years of experience in teaching the subject of life sciences; and (2) participants must volunteer for classroom observations. Teachers not meeting these criteria were not included in the study. Teachers who have at least five years of experience were included as the intention was to uncover teachers' opinions and practices before and after the development of the curriculum. Also, the teachers who volunteered for classroom observations were included because it was important to analyse and compare the espoused and enacted curriculum. Of the sixteen teachers, fourteen were female and two were male. Their teaching experience ranged from five to twenty-two years.

Data collection methods

Dimensions of fidelity of implementation investigated and the data collection methods are displayed in Table 1.

Table 1: The dimensions of fidelity of implementation and data collection methods

Data collection tools	Adherence				Quality of delivery
	Objectives	Content	Teaching-learning processes	Measurement and evaluation	
Interviews	✓	✓	✓	✓	
Observations					✓

Semi-structured interviews

One to one semi-structured interviews, each lasting roughly an hour, were conducted with the participating teachers. Due to the nature of semi-structured interviews, instead of posing a fixed set of pre-defined questions to all participants, the researchers refocused the questions to better reflect the experiences of the participants and/or included prompts in cases where further information was necessary (Yin, 2011). Some of the interview questions were “Do you feel the need to make any adaptations to the curriculum? Why?”; “Are there any parts of the curriculum (learning outcomes, topics, activities, materials) that you believe should be left out? Why?”; “Do you feel the need to add anything to the curriculum during implementation? What? Why?”; “Do you find the curriculum effective? Why? Why not?”; “Do you think the curriculum is appropriate to pupils (needs, characteristics, level, context)?”; “Is there anything you want to change? What? How? Why?”; “What do you think about the learning objectives, content, instructional strategies and assessment components in the curriculum?”. The interviews were carried out in participants’ native language which is Turkish. All interviews were recorded, transcribed verbatim and translated into English by the researchers of this study.

Classroom observations

Unstructured classroom observations, where the researchers were non-participant observers taking detailed field notes rather than making use of a checklist (Gibson & Brown, 2009), were employed. Prior to the observations, the researchers came together to discuss and clarify the focus of the observations. At the outset, it was made clear that the researchers would take detailed notes of the whole teaching and learning process, but pay extra attention to *teaching and learning methods/techniques, teacher and student roles, interaction, use of technology and materials* and finally the *distribution of power* which are considered as the main dimensions of student-centred learning approach (Blumberg, 2009; Weimer, 2002). After the observations, the field notes were compared and further discussed by the researchers.

Ethical considerations

BERA’s *Ethical Guidelines for Educational Research* (2018) were given the utmost attention to ensure the highest ethical standards throughout the study. After getting required permission from the Ministry of Education, preliminary meetings with head teachers and teachers teaching life sciences were held to inform them about the purpose and the importance of the research. Informed consent was obtained from the volunteered teachers making it clear that they had the right to withdraw from the research at any time. During data collection, the participating teachers were also assured that, the data collected would be kept confidential and would be used only in this study. When reporting data,

anonymity was maintained through assigning numbers to the participating teachers. Therefore, the names of all participating teachers were coded as T1, T2, ...T16. The researchers also made sure that the data reported did not contain any identifying elements of the teachers participated in the study.

Data collection procedures

Interviews were administered before classroom observations. The reason for this was to be able to analyse and compare the espoused and the enacted curriculum. In the interviews, the participating teachers were asked about what they think about each component of the curriculum as well as how they implement the curriculum. The observations were conducted after the analysis of the interview data, acting as an effective tool to see the consistency between the espoused and the enacted curriculum. The researchers did not feel the need to observe the participating teachers more than once as the interview data confirmed the data collected from the interviews. The data were collected between October and December, 2018.

Data analysis

The data were analysed by the researchers through thematic analysis which was performed with a focus on similarities, relationships and differences (Gibson & Brown, 2009; Miles & Huberman, 1994). The analysis started with reading and coding the interview transcripts followed by the analysis of the field notes obtained from the classroom observations. Initially, a priori codes - based on research questions - were used to form a basic outline for preliminary categorisation. Regarding interviews, the main components of the *adherence* dimensions of FoI that included *learning objectives, content, teaching and learning processes, assessment and evaluation* and also *the factors that affect FOI* were used as a priori codes. For the *quality of delivery* dimension, *methods/techniques, teacher and student roles, use of technology and materials, interaction* and *distribution of power* were the a priori codes used for the analysis of the observations. The researchers made use of certain analysis tactics that included *noting patterns/themes, clustering/categorising, making contrast/comparisons* and *partitioning variables* (Miles & Huberman, 1994). In addition to a priori codes, empirical codes were also generated inductively. Following coding, thematic categories that were determined before and emerged during the analysis were formed. In the next stage, the data obtained from the interviews and the observations were merged to see convergences and divergences. Direct quotations from the interview transcripts were used while presenting the findings.

Trustworthiness of the study

Credibility (internal validity)

Firstly, *expert opinion* with respect to interview questions was obtained. *Pilot interviews* (Silverman, 1993) to explore whether the questions prepared were capable of gathering the kind of data required for the study were employed with 3 class teachers. *Repeat probing* (Cooper and McIntyre, 1996), where the participating teachers were asked to clarify and elaborate their answers during the interviews, was employed. The main issues raised by the participating teachers were also summarised by the researchers, asking for confirmation

throughout the interviews. Making use of two different data collection methods, interviews and observations, enabled the *triangulation* of data. *Direct quotations* reflecting participating teachers' voices were used to support the findings. *Member checking* (Lincoln & Guba, 1985) was used and the interview transcripts were shared with the participating teachers where they had the chance to edit what they had already said.

Transferability (external validity)

Thick descriptions of research context, data collection tools, procedures, participants, sampling method and data analysis were provided. *Purposive sampling* method, that ensures the selection of participants that would give the kind of data required for the study, was used.

Dependability (reliability)

All interviews were recorded and transcribed in verbatim in order to *prevent data loss*. The *findings of the study* were presented as a separate section without any comments, followed by a detailed discussion section.

Confirmability (objectivity)

The data were coded by both researchers separately. Following coding, *coding checks* (Cohen et al., 2007) were made to assess how the two researchers agreed on codes and themes generated. Inter-coder agreement was calculated through the use of a reliability formula (Miles & Huberman, 1994, p.64) and was found to be in the 90% range. The researchers also kept a detailed record of the procedures of the study to be followed as an *audit trail* (Miles & Huberman, 1994). Expert opinion was received regarding the consistency of the results with the data collected and the results were found to be consistent.

Findings

Differences between the intended and the enacted life-sciences curriculum with regards to adherence and quality of delivery dimensions

Adherence

Codes, categories and the themes formed in line with the adherence dimension of the FoI are presented in Table 2.

The most striking finding obtained from the interviews is that the participating teachers perceive the curriculum as the textbook, a list of topics and content to be taught. The findings reveal that the participating teachers put the textbook at the centre of the teaching/learning process rather than the curriculum:

What we usually do at the beginning of the year is that we get together, we analyse the textbook to see what we are supposed to teach. Then we divide the topics into weeks so we know what to teach each week (T3).

Table 2: Codes, categories and the themes formed for the adherence dimension

Code	Category	Theme
Textbook, list of topics, content	Teachers' perception of the curriculum	Adherence
Overloaded, missing topics, not synchronised, not well organised, repetition of topics, lack of factual knowledge	Teachers' opinions about the content	
Excluding and including topics, tasks and activities, using online and printed materials, giving tasks and activities as homework	Adaptation strategies used	
Main source of knowledge, transmit knowledge, responsible for student learning	Perceived teacher role	
Explanations, question and answer, giving examples, use of board, making students take notes, use of handouts	Instructional processes	
Tests, multiple choice questions, matching, fill in the gaps, short answer questions	Measurement and evaluation tools	

Another participating teacher concluded that "Yes I know the curriculum, I have read the objectives but the textbook is our main source. We try to follow the book" (T1).

Another finding that confirmed the striking role of textbooks was that the participating teachers mainly referred to the textbook when talking about the curriculum: "Of course I use the curriculum. I try to cover all the topics in the book by the end of the year" (T12). "There are missing topics in the curriculum. If you look at the textbook, you see that some important topics are missing" (T2).

Based on the findings, 'content' is perceived as the key component that needs to be implemented. When asked about the curriculum, the participating teachers mainly talked about the topics in the textbooks, ignoring objectives, instructional processes and the assessment components. It was observed that the participating teachers had a lot to say about the 'content' of the curriculum. When talking about the 'content', the participating teachers mainly expressed their dissatisfaction, criticising the amount of topics and activities in the textbooks:

The textbook is overloaded. There are so many topics to cover but we do not have time for that so we omit some parts. I usually omit the activities and the tasks in the book (T12).

Okay most of these activities in the textbook are useful but I never have time to do all of them so what I usually do is to skip some of them (T4).

Statements by T12 and T4 show that the participating teachers tend to exclude some activities in the textbooks to be able to cover all the topics. Some participating teachers

stated that they give some activities to be done as homework, yet, some others confessed that they just omit them as they do not have time to go over them in class.

The participating teachers also stated that the 'content' is not well-organised in terms of topics:

The order of the topics should change. The topics should be synchronised with the ones in Turkish lessons. The previous ones were like that. Moreover, certain topics should be covered in specific time periods (T5).

Participating teachers reported that the 'content' is missing, lacking some very important topics. They believe that topics such as *national holidays*, *classroom rules*, *teachers' day*, *animals' day*, *seasons* and *our school* should be added to the textbooks. When asked what they do about this issue, they indicated that they cover these topics using materials from the previous textbooks and also from the Internet: "I usually photocopy these topics from previous textbooks and distribute them to students" (T16), "I mostly use online resources because these topics are important and we cannot ignore them" (T1). As stated by T16 and T1, making additions to the curriculum through the use of printed and online resources is a common strategy demonstrating variations in the implementation of the 'content' component of the curriculum.

One important issue brought up by almost all participating teachers is that the textbooks contain only activities, lacking the necessary factual knowledge that should be presented:

The curriculum [the textbook] puts too much responsibility on the teacher I think. Teacher is responsible for preparing the knowledge to be presented. First, I present the topic to students, they take notes and then I try to do the activities in the book if time allows (T5).

There were also teachers who stated that they prepared materials for their students. "I prepare texts that summarise main facts and concepts about the topic. We cannot expect students to answer the questions in the textbook without presenting them the topic" (T13). It was evident in the interviews that the participating teachers perceived their role as traditional, making use of teacher-centred teaching and learning methods and techniques that include explanations, question and answer, giving examples through the use of board, and handouts. The participating teachers did not mention using student-centred methods and techniques such as group work, drama, and hands on activities.

The 'assessment and evaluation' component was presented to be a remarkable factor encouraging knowledge transmission among participating teachers. A common concern shared by most participating teachers was that, if they do not convey necessary knowledge, they will not be able to assess the achievement of their students: "I make my students take notes in class. I prepare and transmit the necessary points about the topic. I tell them that I will ask these points in the exams, so they do not object taking notes" (T7). According to the participating teachers' statements, open-ended, matching and fill in the blanks were the most commonly used question types in assessment.

Quality of delivery

With respect to the quality of delivery dimension of the FoI, the codes, categories and the themes are given in Table 3.

Table 3: Codes, categories and the themes formed for the quality of delivery dimension

Code	Category	Theme
Presentation, explanation, question and answer, individual study	Teaching and learning methods/techniques used	Quality of delivery
Printed materials, visuals, videos	Materials used	
Exact authority, source of knowledge	Teacher role	
Passive recipients of knowledge, silent, listeners, quiet, note takers	Student role	
Explanation, presentation	Interaction	
Poorly equipped, no technology, no Internet, small, crowded, students sit in rows	Physical characteristics of classrooms	

Based on the observations, a typical lesson starts with the presentation of a new topic, usually on the board, followed by completion of activities in the textbook, if time allows. Presentations are in the form of lectures with lots of explanations and question and answer. The use of printed materials either from books and/or the Internet, that contained key words and concepts, is widespread. As it was stated, printed materials are distributed to students at the beginning of the lesson. This was a routine done as students had printed materials for each topic presented in their notebooks. Some participating teachers want students to write down some important concepts such as definitions in their notebooks. Presentation of new topic with question and answer took most of the class time leaving very little time for the activities in the textbook. Only a few participating teachers gave the tasks and activities as homework. Only one teacher was observed to use *YouTube* videos to present the topic. It was interesting to see that the video was only used for presentation purposes with lots of question and answer, without any follow up activities or tasks.

The participating teachers are the exact authority presenting new knowledge while students are mostly silent, listening to the teacher. In most lessons, students are not allowed to talk among themselves and have to remain quiet until the end of the presentation stage. The students who attempt to talk are immediately warned by the teacher. There was one-way interaction from teacher to students. It was also observed that the classrooms are poorly equipped lacking computers, projectors and the Internet access. The size of the classrooms is small with approximately 30 to 35 students sitting in rows and facing teacher's desk.

Factors affecting FoI of life-sciences curriculum

Regarding the factors that affect the implementation of the life-sciences curriculum, the codes, categories and the themes are presented in Table 4.

Table 4: Factors affecting fidelity of implementation

Code	Category	Theme
No workshop/seminars, no training, no explanation on how to use the textbook, not knowing the philosophy/rationale of the curriculum, just presentation of textbooks	Lack of professional development	Factors affecting fidelity
No guidance, no sample activities, lack of necessary knowledge about topics	Lack of teacher's book	
No time for the activities, hurry/rush to cover the content, no time for learner centred activities	Time constraints	
No technology, no Internet connection, not enough materials, no labs	Insufficient resources	
Crowded classrooms, high number of students	Large number of students	

In light of data collected, lack of professional development, lack of a teacher's book, time constraints, insufficient resources and having large number of students are the factors that hinder FoI. As participating teachers reveal, the life sciences curriculum and the new textbooks have recently been put into use in schools without providing any professional development: "There was not any training. Not that I know. Not in this school" (T15). This was a common statement shared by the participating teachers. One of the participating teachers who had 15 years of teaching experience commented on the new curriculum and textbooks in the following way:

The curriculum and the new textbooks are completely different from the previous ones. I do not understand why they have changed them. What is the rationale behind it? I have no idea. They [curriculum developers working for the Ministry of Education] did not tell us anything about it (T5).

One of the participating teachers' statements who had more than 10 years of teaching experience draws attention to the issue of training in the following way:

Apparently, these textbooks are written with a specific teaching philosophy in mind. I guess, we as teachers are not expected to transmit knowledge anymore but what is our role then? People in the Ministry should tell us what to do with these books (T11).

Only few participating teachers mentioned professional development while also expressing their discontent towards the content of the sessions offered to them. T3 talks about the training in the following way:

It was not a real training session. The authors of the textbooks came and gave us some information about the new textbooks. That was all. They did not tell us anything about how to implement the curriculum.

Another criticism raised by almost all participating teachers is not having a teacher's book that would guide them in the teaching and learning process: "Can you imagine? We do not

have a teacher's book. We were told that they are not ready yet. There is nothing to guide and support us. We are completely on our own" (T7).

Insufficient resources in state schools, for example lack of technology and materials and having large numbers of students in classrooms, were also reported to be important factors preventing teachers from doing the activities in the textbooks.

I have more than 30 students in class and they all want to express their opinions; they all want to participate because they love the subject. They get frustrated so easily when I do not give them the chance to speak, so I prefer not to do these activities at all (T13).

Another factor that hindered was reported to be time constraints. As the participating teachers stated, due to having only one class hour allocated to teaching life-sciences, they found it difficult to cover the topics:

We only have one class hour which is 40 minutes given to this subject and there are many topics and activities in the textbook. Do they think 40 minutes is enough? (T4).

I usually give some activities as homework so I spent at least 10 to 15 minutes to check whether they have done it or not, and also go over it. This means that I only have 25 minutes to teach a topic (T13).

Discussion and conclusion

The findings reveal a gap between the intended and the implemented curriculum, indicating that the life sciences curriculum is implemented with low fidelity for various reasons. Regarding the key components, 'content' seems to receive the most attention by the teachers. The participating teachers perceive the curriculum as the textbook, a list of topics and content to be taught showing that the participating teachers tend to follow a topic-based approach, using textbooks as a reference in the implementation process. The study conducted by Kara et al. (2017) also showed that despite educational reforms, content-based teaching is still used widely in schools. This study provides evidence that the life sciences textbooks play an important role, acting as the implemented curriculum in schools. The role of textbooks is also emphasised in the literature reporting that textbooks mostly act as mediators between the intended and the implemented curriculum (Schmidt et al., 1997; Valverde et al., 2002).

However, literature also underlines the fact that too much reliance on the textbooks can be a concern, particularly when they become more influential than curricula in educational systems (Foster, 2006; Foster & Crawford, 2006). This seemed to be the case in this study, demonstrating that the teaching of life sciences is based on the textbook rather than the curriculum. One reason for this may be the fact that, the life sciences curriculum was developed for the first time in North Cyprus and before that the teaching of the subject was based on the textbooks. Therefore, this might be the reason why teachers perceive the curriculum as a list of topics and the textbook to be taught. The statements echoed by the participating teachers during the interviews aligned well with what Yurdakul (2011) and Kaya et al., (2012) found in their studies depicting that teachers tend to perceive curricula

as a list of topics, a guide book, a resource book and a textbook – an issue which has a negative impact on implementation fidelity. Another reason for this might be lack of professional development opportunities offered to teachers. Literature on curriculum studies clearly indicate that, curricula cannot be implemented effectively unless proper training in using the curriculum is offered to teachers (Bümen et al., 2005; LaChausse et al., 2014).

The participating teachers mainly commented on the content component, complaining about the topics in the textbooks. Findings show that the participating teachers follow the adaptation approach through including and excluding topics. The findings support the studies indicating that teachers tend to follow the adaptation approach for various reasons (Çaycı, 2018; Dikbayır & Bümen, 2016; Karaman, 2019; Kaya et al., 2012; Tokgoz Can & Bümen, 2021; Yazıcılar & Bümen, 2019).

The findings indicate that the participating teachers still possess traditional teacher roles, perceiving themselves as the only source of knowledge and responsible for knowledge transmission. The participating teachers are the authority conveying knowledge in the classroom. Similarly, students have traditional roles as they are expected to remain quiet and take notes most of the time. The physical characteristics of classrooms also confirm traditional teaching, where students sit in rows with hardly any interaction among them. This contradicts the philosophy of the curriculum that claims to be student-centred, encouraging teachers to be a guide who supports construction of knowledge through active participation in the teaching and learning process. The fact that the participating teachers feel the need to transfer knowledge through using materials from other sources and dispense with the tasks and exercises in the textbooks and also are not making use of student-centred methods such as pair or group work, hands on activities, role-plays and experiments indicate that traditional teacher-centred teaching styles are still used widely by the participating teachers. It is worth noting that the participating teachers do not make use of the student-centred methods and techniques recommended in the curriculum, but stick to the traditional ones that include presentations, explanations and question and answer. Similarly, it is surprising to see that almost none of the participating teachers mentioned about using alternative assessment methods that include portfolios, pair or group work, presentations and performance assessment. Although the teachers had the freedom to decide on their assessment methods, they prefer to use the traditional ones that include multiple choice tests, matching, fill in the gaps and short answer type of questions.

Although the new curriculum claims to be student-centred and based on constructivism, the findings demonstrate that the participating teachers make use of a teacher-centred approach. The reasons for this might be that the participating teachers are not aware of their new roles and/or they do not have the knowledge and skills to implement student-centred approach. All these findings are in line with Dikbayır and Bümen's (2016) study showing that teacher-centred approaches are used widely in classrooms. The findings corroborate previous studies in the literature revealing that teachers perceive their role as a presenter performing traditional roles and making use of traditional methods and techniques (Aykaç, 2011; Gelmez-Burakgazi, 2020; Kara et al., 2017; Kaya et al., 2012) and

traditional assessment methods (Dikbayır & Bümen, 2016; Kara et al., 2017, Karaman, 2019).

Lack of professional development, lack of a teacher's book, time constraints, insufficient resources and having large numbers of students in class were found to be the factors that hinder FoI. Based on the findings, it can be said that teachers are expected to implement the curriculum without any support and guidance. The factors that inhibit FoI are in line with the previous research (Bümen et al., 2014; Dikbayır & Bümen, 2016; Dusenbury et al. 2003; Gelmez-Burakgazi, 2020; Kara et al., 2017; Kaya et al., 2012; Yazıcılar & Bümen, 2019). The results of the study shed light on the urgent need for providing professional development to teachers on the implementation of the newly developed curriculum. The participating teachers definitely need to engage in professional development, without which expecting them to implement the curriculum with fidelity seems to be a distant dream. Lack of professional development opportunities for the teachers coupled with lack of teacher's books create variations in their implementation of the curriculum in terms of what, how much and how to present. Related research (Çaycı, 2018; Kaya et al., 2012; Öztürk, 2015) indicates that teachers face difficulties in putting an intended curriculum into practice when they do not receive guidance on teacher roles and teaching and learning processes that include effective approaches, methods and techniques, and sample activities.

FoI can be enhanced through curriculum training. In this context, teachers definitely need support in order to implement the life sciences curriculum with fidelity. Research displays a close relationship between teacher training and FoI. Curricula cannot be implemented with high fidelity unless teachers are properly trained in using the curriculum. Professional development, support from administration and providing continuous technical support that includes classroom observations and collaborative coaching leads to high levels of fidelity. Professional development should be systematic, starting with needs analysis followed by hands on workshops based on teachers' needs and expectations. Workshops are effective, providing teachers with the necessary knowledge and skills together with opportunities to practice, followed by feedback on the practice. Discussions on the importance of implementation fidelity highlighting how adaptations or omissions can have an impact on learning outcomes also play a significant role. Moreover, involving teachers in decision making rather than dictating to them what to do in the planning and the implementation process would increase the level of fidelity.

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