

Vocational Education and Training Reform in the Republic of Serbia

Manual 6

GUIDE FOR TEACHERS TO IMPLEMENT NEW CURRICULA

Vocational Education and Training Reform Programme – Phase II

May, 2008.

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Introduction

This guide/ handbook is one in a row of handbooks, developed or revised by VET reform Programme – Phase II. The phase II programme was asked to revise existing handbooks or develop new ones. This guide is a revised version of the ‘Guide for teachers to implement the new Curricula’ that was developed by VET Reform Programme – phase I. The existing guide has been kept with almost the same text, but with some additional materials added.

The main purpose and goal of modifying the curricula or introducing new curricula is the improvement of the teaching and learning process, as well as the quality of knowledge, skills and working competences, gained and mastered by student in the process of adoption of the curricula.

In secondary VET curricular innovations present the permanent need, caused by technological development and development of the labour market and public economy. When the scope of changes is so wide that it exceeds the level of teaching contents on individual school subjects, it is necessary to fully innovate the curricula and replace out-dated curricula with the new ones.

In the course of time interest of students for certain curricula decreases in a great deal (the enrolment of students into secondary schools is a relevant indicator) or they become less attractive in respect of economy’s needs (the crisis of certain economic and non-economic branches). In that case such curricula are in the status quo position – there is no student enrolment into these educational profiles and they are not included in the open competition at republic level.

When new knowledge and skills are needed at the labour market, referring to existing occupation or new occupation, it is necessary to start up designing the curricula for relevant educational profile, serving as a basis for an occupation. New curricula may be tested before the implementation by introducing pilot programmes.

Both social partners and a wide range of experts from the field of education are involved into designing of the curricula. The procedure on preparation of new programmes may be initiated by: some schools, the community of schools, social partners, the Centre for Vocational and Adult Education, the Ministry of Education of Serbia.

When the curriculum is verified through publishing in the “Educational Gazette” in respect of its implementation in school practice and when the schools where the curriculum is to be implemented are selected through the schools’ network, it is necessary to support schools in implementation of new curriculum.

All the stakeholders have an important role in implementation of new curriculum at school level – students, parents, teaching and non-teaching staff at schools (principals, teachers, teachers-associates and professional support staff – pedagogues, psychologists), social partners, local community. The support and help are provided by the Ministry of Education of Serbia, the Centre for Vocational and Adult Education, local authorities, school boards.

The effectiveness of implementation process depends on several factors. Most of all, it is needed the consensus and involvement of all actors in the process. Each actor shall consider the consequences on his role in the implementation process of new curriculum.

Getting familiar with the implementation process of new curriculum is based on the system of instructions and explanations where teachers, individually and as a part of the group, are introduced with new curriculum, aimed to develop students' knowledge, skills, attitudes and various types of behaviours. It means introduction of new resources. Each change demands investing efforts - to cope with a series of problems emerging in the process, to organise and manage implementation and achieve objectives set. The implementation also requires: human resources, financial resources and the timeframe determined by school calendar and operation plans as well, deriving from the curriculum.

The effectiveness of implementation requires permanent action, mutual cooperation of stakeholders.. Examples of mutual support in schools or between schools or regions should cover the networking, constant communication, joint actions, conferences, etc.

In order to obtain successful implementation, the atmosphere of support is necessary. Its characteristics are: mutual confidence and open communication between actors in schools and out of schools, resolving problems, engagement of most members of the school staff. The principals have a key role in such processes. They should be: well acquainted with projected changes and holistic implementation process, willing to be involved in the process of changes and prepared for it, and capable to put into practice various management and decision-making strategies in order to respond to teachers' needs. In larger schools, where the role of the principal is primarily managerial, the head of pedagogical school management (assistant director or deputy director, organiser of the instruction for certain sector) is in charge of such tasks.

The required characteristics for efficient realisation of their responsibilities are:

- Readiness for an open and immediate communication and cooperation with all CATs
- Strengthening and building of stable school community through ensuring professional development and career advancement for the school staff;
- Providing external (out of school) professional evaluation, when it is needed;
- Readiness to take risks;
- Positive attitude towards projected changes and using the enthusiasm to motivate others.

Strategies on Implementation of a New Curriculum

The application of new curriculum shall be based on planning of physical, human, information and financial resources in order to ensure high quality teaching and learning of students in the educational process. The teaching process is performed through the class system, mentor activities, practical activities in school or factory workshops, activities in laboratories, project activities, study visits, and professional practice.

The quality of overall educational process does not depend solely on the quality of the curriculum, but also on the mode of its realisation. Main factors affecting on the quality of curricular implementation present all together basic elements of the very implementation process.

Main implementation elements are:

- I Adequate conditions for realisation of the curricula;
- II Informing teachers and students on aims and outcomes of new curriculum;
- III Informing teachers on the structure of the curriculum and its role in overall teaching process at school;
- IV Teacher training and training of all realisers of the curriculum;
- V Preparation of relevant learning materials;
- VI Efficient managing of curricular implementation process;
- VII Monitoring of instruction process realisation;
- VIII Connecting with enterprises and other social partners.

Implementation Elements

I ADEQUATE CONDITIONS FOR REALISATION OF THE CURRICULA

Each curriculum applied at school level is defined by learning outcomes, teaching contents and:

- The standard (the set of norms, enactment) on premises, equipment, financial resources; as well as
- The standard (the set of norms) on qualifications of teachers, teachers-associates and professional support staff (i.e. pedagogues, psychologists) needed for professional realisation of the educational process, learning process of teaching students to enable them to perform tasks at their work place in the framework of a certain occupation.

School verification means that the school meets all above mentioned conditions. When the schools are selected for the realisation of pilot programmes or the application of new curriculum is to be approved for some school, school verification shall be the first step in this process. The decision on verification issued

by the Ministry of Education of Serbia serves as a proof for it and it is based on previous inspection visit to the school by pedagogical advisor (educational inspector).

Implementation phase of a new curriculum is of a great importance for school management and professional support staff, due to the fact that it provides necessary information on:

- Organisational mode of teaching process - by school subjects and modules, prescribed by the curriculum;
- Teaching tools needed for realisation of the teaching process (for instance: PCs, photocopy device, paper, graph-folios, markers, chemicals, etc);
- Modes of teaching process monitoring, according to relevant programme, at school level (internal evaluation) and at republic level (external evaluation);
- Need for organising in-service teacher training in certain areas.

II INFORMING TEACHERS AND STUDENTS ON AIMS AND OUTCOMES OF THE NEW CURRICULUM

There are various sets of information relevant for introducing a new or revised curriculum into school practices:

1. School staff - information: about aims and outcomes of vocational education for given educational profile; aims and tasks of new curriculum; its structure (instruction plan, school subjects, modules), planned operation modes and evaluation system;

2. Parent and student - oriented information

- **Before student enrolment**, - including clearly defined VET aims and outcomes for relevant educational profile;
- **Information aimed to students enrolled into relevant educational profile**, that, apart from VET aims and outcomes for relevant educational profile are to be informed on: instruction plan, class timetable, approximate testing timetable, written assignments, revision tests, individual student works / projects, professional practice, excursions etc.

This implementation element presents at the same time the phase on involving teachers and the professional support staff in the implementation process. These pieces of information may be prepared partly by the school, in cooperation with the Centre for Vocational and Adult Education and the Ministry of Education of Serbia. One information segment derives from official document, published in the Educational Gazette, and the second segment derives from School-based Programme, that is, the School Operation Plan, designed on the basis of agreement made within the Class Council.

Implementation phase includes innovating and upgrading of skills, comprehension and knowledge of teachers and the professional support staff, according to main objectives of the curriculum. This process is supposed to be realised through its various forms and types (exchange of ideas and attitudes, in-

service training, seminars, trainings), at special meetings of the school staff or at meeting of the councils and cluster teachers¹ at school level.

Such activities are crucial for teachers, due to the fact that prompt provision of information ensures quality teaching and it enables qualitative learning process.

III INFORMING TEACHERS ON THE STRUCTURE OF THE CURRICULUM AND ITS ROLE IN OVERALL TEACHING PROCESS AT SCHOOL

The Class Council responsible for immediate realisation of the curriculum consists of teachers and teachers-associates. Along with school management staff responsible for the teaching process in school and professional support staff, they are directly involved in application of the curriculum.

The curriculum is a public document and thus available to all stakeholders, but in introducing the new curriculum or revisions in existing curricula it is important to establish contacts between authors of the curriculum on one side and the implementators on the other side, particularly in the case when usual and accepted format or attitude towards the curriculum has to be changed.

Since pilot curricula are based on modules, aims, learning outcomes and recommended teaching contents, it is necessary to help teachers to:

- Understand outcomes and the very essence of outcomes-based VET;
- Operationalise learning outcomes through teaching contents;
- Recognise teaching methods and modes that are the most appropriate for the realisation of such curricular concept;
- Determine the list of professional literature for teachers and students as well, to be provided, i.e. recommended, by school to students and parents;
- Define assessment methods to be implemented for each module separately and holistic assessment procedure for school subjects; (Please, refer to Handbook on Assessment in Secondary Vocational education and Training)
- Design the timetable of school subjects and modules' realisation - in the course of school week, month, classification period, during school year²;
- Recognise mutual connections between modules within the same or different school subjects, in the framework of holistic curriculum;

¹ Professional body encompassing teachers of the same school subject at school level

² There are four classification periods during school year (i.e. two in each semester), each lasting three months. Their purpose is to present the interim status of student performance and grades.

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- Determine the timetables of testing, revision tests, written assignments, individual student works / projects, professional practice, excursions etc. to avoid overlapping and overburdening of students in the course of the same day, week or month.

Understanding of Learning Outcomes and the Very Essence of Outcome-Based VET

This implementation element means the clarification of educational process ensuring achievement of aims and learning outcomes set within relevant module (adopted knowledge, mastered skills and working competences). Naturally, it includes explanation of the term: “module outcomes”.

The outcomes have a key role in the process of structuring and development of secondary VET programmes, that is, the teaching and learning process. The outcomes are more closely determined by the following levels:

- Effectiveness level;
- Efficiency level; and
- Interests level.

Effectiveness level shows whether we do the right thing, that is, whether the teaching is well-organised and projected to enable achievement of the aims set. The point is not in the very nature of aims, but in their achieving – whether they are achieved or not.

Efficiency level is determined on the basis of time and money needed for organisation and realisation of teaching and learning, leading to outcomes set.

Interests level shows the extent of students’ interests for learning and its final effects.

The purpose of having learning outcomes:

- To determine what student knows or is able to do i.e. the learning effects which have to be formulated as active verbs; - (for more information about formulation of learning outcomes, please refer to the ‘Handbook on methodologies for the development of competency-based modular curricula in VET’);
- To enable flexible time planning, in accordance with defined outcomes, within the module; In pilot curricula teaching and learning are organised and implemented through **modules**. The module is defined as the set of functionally connected knowledge, skills and abilities (working competences) needed for performing a certain job/task.

Through their structure, modules enable gaining various kinds of knowledge and competences, development of relevant set of skills and cross- disciplinary and cross-subject connections of various teaching contents.

Operationalisation of Learning Outcomes through Teaching Contents

Planning and realisation of teaching and learning related to outcome-based curricular model requires that initial element shall be an outcome. It serves as a basis for defining modes of evaluation and validation of outcomes. The outcomes are to be clearly defined.

In designing of operation plan, each teacher has to ask himself/herself:

- How to achieve the stated outcome through the learning process?
- What students should know and or be able to do in order to be able to demonstrate achievement of the outcomes?
- How does the curriculum look like for my school subject?
- When to carry out the assessment and which instruments to be used?

When designing the operational plan, each teacher has to take the point of departure in the learning outcomes. An example is given in Annex 1.

The Most Appropriate Teaching Methods and Modes for the Realisation of the Curriculum

A successful teacher is supposed to implement optimal didactic method to achieve the best result in the educational process. It means interaction between teachers and students in respect of achieving outcomes defined by the curriculum.

The application of educational methods is determined by outcome level and the conditions of teaching process realised at school. It is assumed that teachers are competent in realisation of such methods. However, training for application of new methods can be included into the provision of in-service training.

A clear picture on possibilities of teaching process' realisation at school level is provided through implementation seminars realised in cooperation with the authors of the curricula and different training sessions on teaching methodologies (realised in co-operation with CAT). The purpose of these seminars is to enable teachers, according to prescribed curricula, to perform the following activities

- To translate the aims and outcomes into their operation plan; (an example of an operational plan, suitable for the planning according to learning outcomes, can be found in Annex 2)
- To notice possible problems; and
- To make the list of needed in-service trainings.

These seminars, at the same time, would enable, to the authors of the curricula, an apparent insight into transparency and accurateness of the curricula, i.e. their flexibility in respect of achieving certain outcomes and the usefulness of recommended teaching contents, teaching methods and assessment modes, or the need for their redefining.

IV TEACHER TRAINING AND TRAINING OF ALL REALISATORS OF THE CURRICULUM

V PROVISION OF ADEQUATE LEARNING MATERIALS

New curriculum, particularly in the case of pilot curriculum, needs to be accompanied with new adequate learning materials. The role of teacher consequently becomes even more difficult and responsible.

In the framework of pilot curricula each school subject/module includes relevant literature for teachers and students. According to their knowledge and experience, teachers can prepare adequate learning materials and distribute them to students.

Teachers and students emphasize the need that learning materials are to be written by secondary school teachers, since they are familiar with cognitive features of students of that age, and the correlation with other similar school subjects within the curriculum as well.

One of the numerous ways to develop student habits of searching for information is through use of the Internet and other technical aids.

During the life time of the VET Reform programme – phase II the project has delivered training in production of teaching materials and in this relation a Writer Guide was developed and used. Please, refer to Annex 3 for the Writer's Guide.

VI EFFICIENT MANAGING OF CURRICULAR IMPLEMENTATION PROCESS

To achieve best results through implementation of the curriculum it is needed to enable students to gain necessary professional knowledge, master skills and working competences. It is not enough to design programme well, and that teachers are the best pedagogues and experts, but to have efficient managing by the school management as well.

Principal / pedagogical decision-maker at the school and the professional support staff are to create conditions for implementation of the curriculum through the instruction process, as it is defined by the curriculum. Professional councils in charge for school subjects should also be involved into realisation and monitoring of teaching process.

VII MONITORING OF INSTRUCTION PROCESS REALISATION

When the new curriculum is implemented at school, it is important to set up monitoring commission for the realisation process and its results – student achievements. At the same time, it is desirable to organise regular meetings of members of the Class Council aimed to exchange of information, mutual support and cooperation. One of the members of the Class Council, who is at the same time a member of school monitoring commission, is to be in charge for the managing of implementation process. Naturally, the best solution is to choose one of vocational subject teachers (if he is also the class teacher, it is an advantage) due to the fact that he/she has the best insight into all aspects of the instruction process in the class.

To facilitate monitoring of the process and its results, it is needed to form the data base on all actors in the process. Regular updating of the base enables regular monitoring, at school and republic level. The data base would serve as a basis for interventions in students' and teachers' work, when it is necessary and needed evaluation of the curriculum which is teaching contents.

The data base can be placed in one PC, that is not used for teaching purposes and that is available to all teachers, members of the Class Council, and the implementation process monitoring commission.

It should encompass the data on:

- Students attending the education in accordance to new curriculum (personal data; the performance by school subjects and classification periods - for individual students and for whole class...);
- Teachers delivering the instruction in the class (personal professional data; in-service trainings – the previous ones and the planned ones);
- School timetable;
- Social partners contributing to the realisation of the instruction process;
- School subjects and modules (module questionnaires, operation plans on module realisation; learning materials; written assignments; tests ...)

VIII CONNECTING WITH ENTERPRISES AND OTHER SOCIAL PARTNERS

The VET curricula are partly realised in the practical segment of the sphere of work (factories, workshops, hospitals, enterprises, tourist facilities and so on.....) through practical teaching, or teaching in the block, or professional practice. Therefore it is necessary to establish firm links with relevant social partners, on the basis of drawing up the contracts on realisation of certain instruction segments.

VET school is obliged to spread the network of social partners since it is obvious that in the practice it is impossible to provide realisation of learning segment in a single enterprise. On the other side, it is necessary that student during schooling realises this segment through engagement at various work places, to master the skill of adapting to various working conditions.

Social partnership is needed also to channel further development of school, i.e. harmonisation of the enrolment policy with the needs of the local economy, i.e. local social partners.

Due to all these reasons, working positions for realisation of practical instruction have to be provided in accordance with the tasks set in the curriculum. Social partner is to get familiar in detail with new curriculum and has to ensure free cooperation of its "instructors" (they work with students during realisation of the instruction in their facilities) and teachers in charge of practical instruction at school. They define operation plan and perform student assessment together, in accordance with the curriculum and current conditions at the enterprise. Social partner is obliged to provide his opinion

on the curriculum even during its implementation, to enable standardisation of this segment during its possible redefining. Finally, social partners are the members of examination commissions at the final examination or VET “Matura”.

Recommendations to Seminars about the Implementation of the new Curriculum

In order to ensure successful realisation of instruction process according to these curricula, it is needed to organise seminars with the class councils in all schools. The seminars will be facilitated by the authors of the curricula for each educational profile.

Seminar’s agenda shall be designed to enable group activities (class council) and individual activities of each teacher with the author of the curriculum on relevant school subject.

To achieve uniform structure of these seminars for each educational profile it is necessary to train authors – presenters, in respect of organisation of activities during seminars.

School seminars should be organised in three segments:

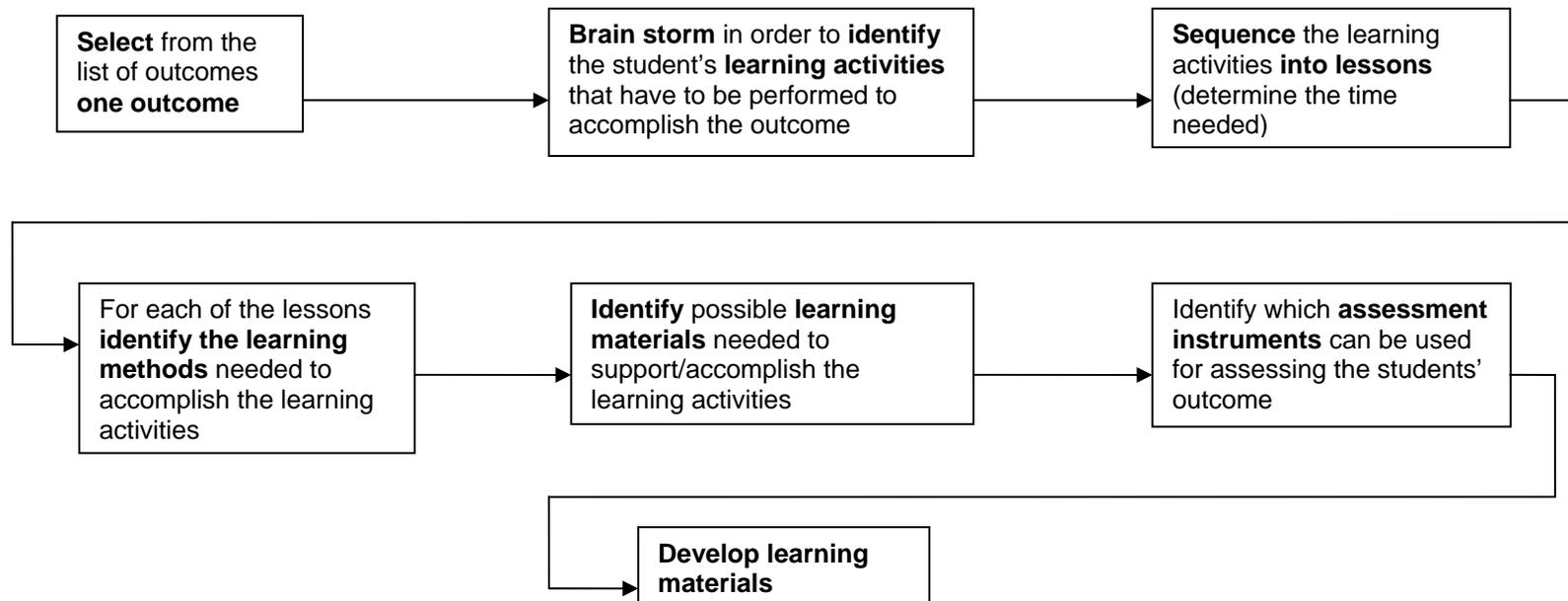
1. Presentation of the curriculum for each educational profile realised in school (work with the class council)
 - The framework for implementation of the curriculum in school practice;
 - Aims and learning outcomes of educational profile;
 - Instruction plan;
 - Organisation of the instruction.
2. School subjects (group activities)
 - The curriculum for given school subject;
 - Designing of operation plan on module/ topic, on the basis of the document;
 - Literature for teachers and students;
 - Teaching methods;
 - Assessment modes;
 - Correlation with other school subjects.
3. Pilot monitoring (activities with the class council and the pilot monitoring school commission)
 - Monitoring of pilot curriculum realisation;
 - Evaluation questionnaires and survey questionnaires;
 - Pilot class data base.

It is needed to enable teachers to study official document *The Curriculum of Educational Profile Pilots* and the curricula for school subjects under their responsibility. Doing so the effectiveness of seminars would be ensured, since teachers and organisers of instruction at school level would be able to recognise possible issues and problems to be resolved during seminar activities.

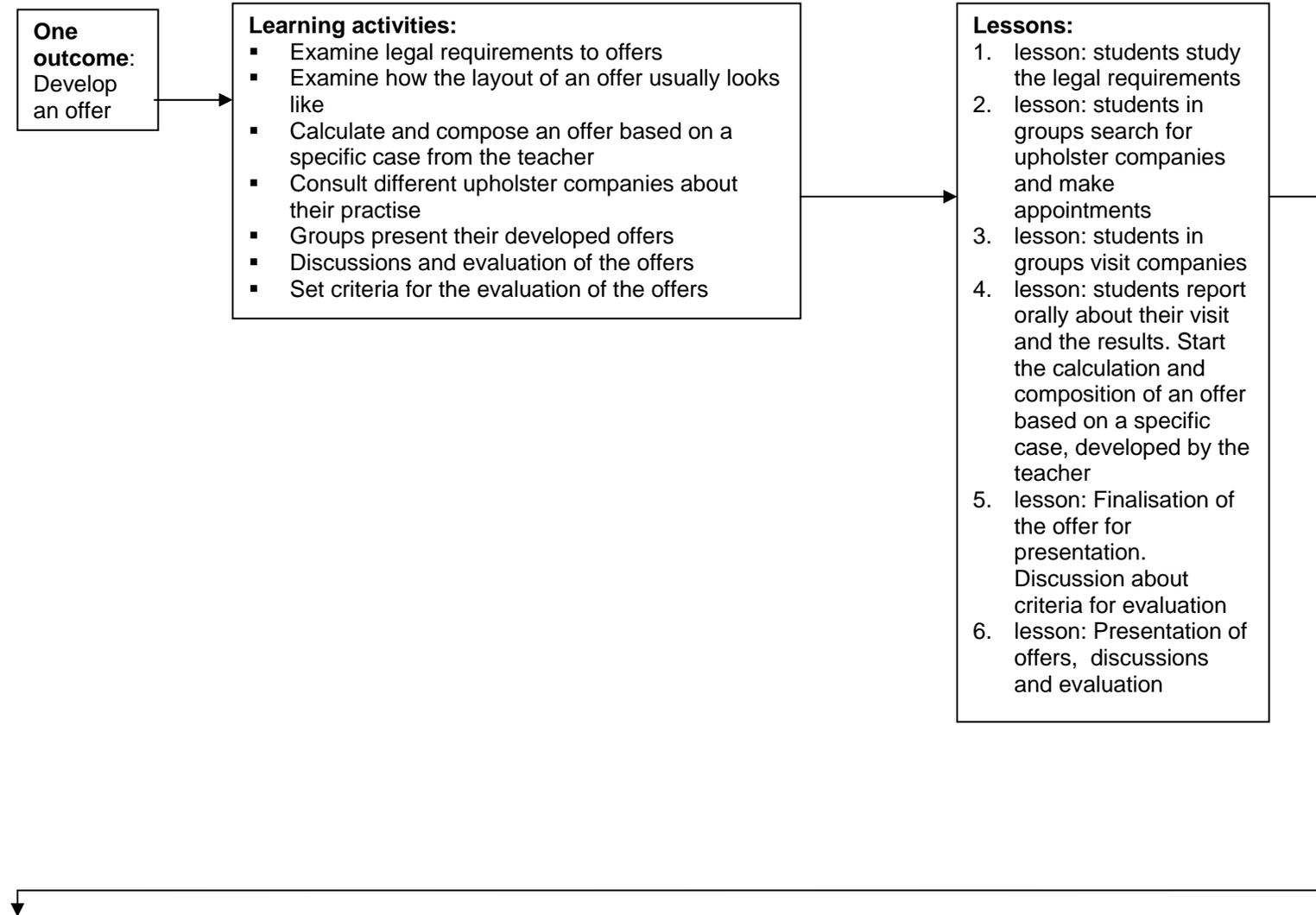
ANNEX 1.

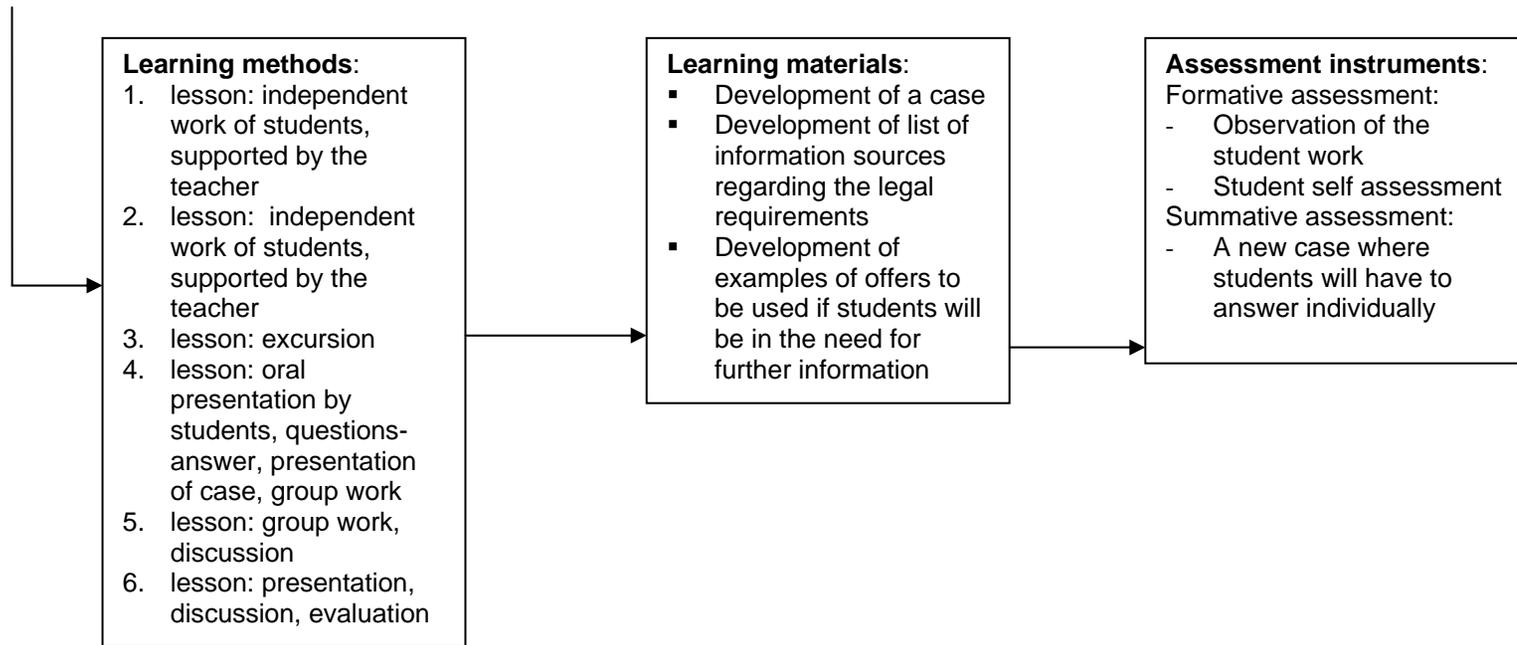
Implementation of new curricula

Steps to be followed:



Example from upholster





ANNEX 2

Writers' Guide

A practical handbook for writers of teaching and learning materials

CONTENTS

1. WHAT IS THE PURPOSE OF THIS GUIDE?

- Why Teaching and Learning Resources (TLRs) and not textbooks?
- What is the main purpose of writing TLRs?

2. WHAT ARE THE CRITERIA FOR WRITING GOOD TLRs?

- Advice from Serbian writers and teachers
- **General criteria for writers of TLRs**

3. THE OVERALL MATERIALS DEVELOPMENT PROCESS

- Key steps

4. WHAT MAKES GOOD TLRs?

- Interactive learning activities

5. WHAT SHOULD GOOD TLRs LOOK LIKE?

- Layout issues
- Illustrations

6. HOW WILL INFORMATION TECHNOLOGY CHANGE TLRs?

- Using modern computer technology
- Electronic publishing
- Advantages and essential conditions for effective electronic publishing

7. WHAT NEXT?

1. WHAT IS THE PURPOSE OF THIS GUIDE?

Why do we refer to TLRs and not 'Textbooks'?

In this guide the phrase TLRs is used instead of the word 'textbook'. The table below suggests why.

	Traditional teaching (textbook only)	Student-centred learning (textbook as one resource)
<ul style="list-style-type: none"> Description 	<ul style="list-style-type: none"> Teacher-centred formal teaching Transmit information One-way communication Acquiring information Memorising Learning by rote 	<ul style="list-style-type: none"> Student-centred learning Stimulate learning by thinking and doing Two-way communication Processing for understanding Demonstrating skills
<ul style="list-style-type: none"> Examples 	<ul style="list-style-type: none"> Copying from the blackboard Reading and copying from the textbook Reading the textbook and answering the questions 	<ul style="list-style-type: none"> Textbook as a resource, supplemented with other materials Solving problems together Doing investigations Writing original essays (no copying!) Having a debate Making a presentation

What is the main purpose of writing TLRs?

This guide aims to help present and future writers develop more effective teaching and learning materials.

International practice indicates that the traditional teaching methods as described above and the use of textbook-based teaching alone will not provide the stimulus that students need to make them into confident and independent learners.

The main purpose of writing TLRs is to help 16 to 19-year old students to learn and teachers to teach. Keeping to the following four main guidelines when writing materials will help to achieve this purpose.

The three main materials writing guidelines

1. ***Write clear and readable text*** which makes students use their current knowledge
2. ***Include relevant and stimulating illustrations, charts, diagrams and tables*** which help students to understand new ideas
3. ***Include exercises and activities which*** help students to deepen their understanding and to use the ideas and skills in the subject they are studying

2. WHAT ARE THE CRITERIA FOR WRITING GOOD TLRs?

TLRs must be effective for both students and teachers and should be easy to teach from and easy to learn from.

Some general rules and observations

1. Writers must consult the teachers in order to make the text and concepts fit the reading and conceptual level of the students and their interests
2. Writers should focus their work on the entire range of students in Serbia including those outside Belgrade who have quite different backgrounds and needs.
3. The language of the text should be suitable for students of all abilities including the less academic students.
4. The outcomes from the vocational modules or general vocational subjects should be a starting point for planning TLRs
5. TLRs should:
 - Encourage students to be active
 - Not simply provide information
 - Challenge students to think critically
 - Contain student activities and projects
 - Emphasise concrete tasks and results
 - If possible link the vocational modules to the general vocational subjects and general subjects taught.

General criteria for writers of TLRs

International experience of writing TLRs indicates that writers of the best materials:

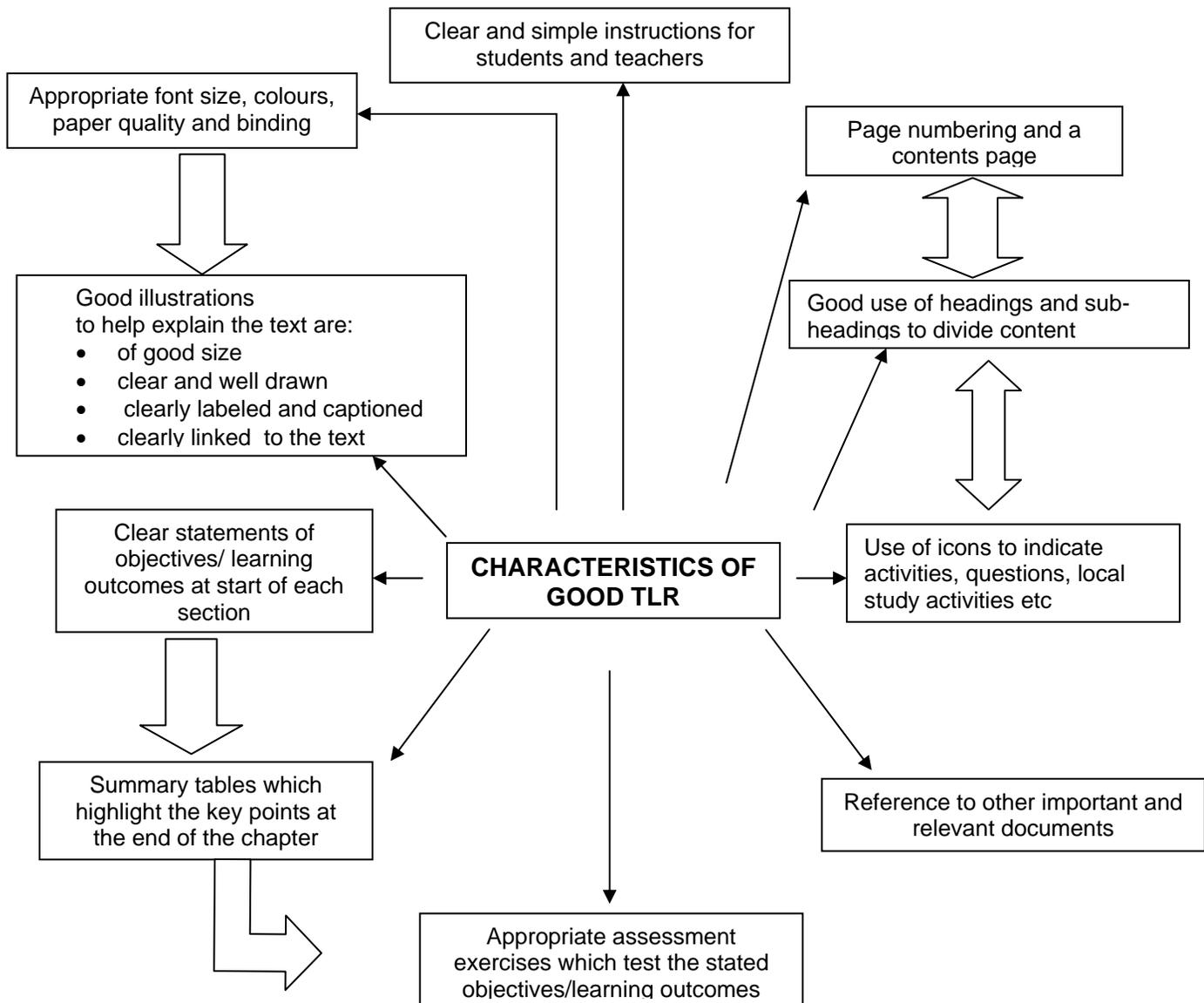
1. Arrange and lay out the text in a clear and logical way and include illustrations and graphics that strengthen the learning
2. Write in a clear and interesting way that is readable for students; it is helpful to use examples and ideas relating directly the students' own experiences
3. Link the chapters and sections together with summaries and introductions
4. Be sensitive to cultural and gender differences and the various learning needs of students in different part of the country
5. Ensure that the work is original, clear and relevant both to the subjects and to the students' learning needs
6. Write so as to correspond and cover fully to the outcomes
7. Make the content accurate, up-to-date and free from errors
8. Consider the use of colour, the fonts, and the sort of paper
9. Ensure that the style and content of the teaching materials correspond to current educational policies and practice
10. Include activities that stimulate students to process and use the material in the text

3. THE OVERALL MATERIALS DEVELOPMENT PROCESS

The key steps are as follows:

- Needs analysis (what do students and teachers need? = what am I supposed to write and who is the intended reader, what is the age and level of ability of the students)
- Analysis of the existing outcomes in modules
- Interpreting the outcomes to meet students' needs
- Identifying suitable material for adaptation or planning the new material
- Piloting draft materials in schools and try it out on a sample of students
- Redrafting materials
- Distribution
- Monitoring and evaluation of the materials in schools
- Revised edition

4. WHAT MAKES GOOD TLRs?



Interactive learning activities

To promote critical and creative thinking, the TLRs should include student-centred activities. They will encourage students to think rather than simply receive information.

These are some of the things that student-centred activities might include:

- answer 'open' questions, starting with “Why” and “How”
- solve problems in groups
- do investigations
- research and write
- make reports to the class
- have debates.

Books and other learning materials are important in the process of encouraging students to think and solve problems.

5. WHAT SHOULD GOOD TLRs LOOK LIKE?

Layout issues

1. Readability through the use of spacing, margin width, appropriate typeface and size and of 'white space' (part of the page with no writing or illustrations).
2. Consistency but variety in the use of bold and italic type, bullet points and type faces and sizes used.
3. Use of blocks of information to make divisions in the text, activities, well-designed diagrams and photographs.
4. Inclusion of symbols and icons to vary the text and direct students to important information.

Illustrations

All TLRs written for senior secondary students should contain a variety of diagrams, charts, tables, figures and illustrations (drawings and photographs). These illustrations will inform students, help explain important points and encourage students to read the text. In short, the readability level of the text will be greater. Listed below are some of the types of illustrations used in TLRs for some of the general subject areas:

- **Language:** drawings to illustrate what is happening in a conversation or story, a photograph of places in Serbia mentioned in text, tables for completion with ideas taken from a reading passage.
- **History:** maps of countries and trade routes, pictures of important people in history, photographs of historically significant cities and buildings.
- **Geography:** map showing ocean currents, chart showing Belgrade's temperatures and rainfall by month, photographs of significant natural features such as mountain ranges.
- **Economics:** table or chart showing Serbia's imports and exports, a photograph of a stock exchange trading floor, etc.

- **Chemistry:** drawing showing the steps in an experiment, flowchart showing steps in transforming silicon into glass, diagram showing the components of an atom, etc.
- **Mathematics:** graphs of population growth, drawings of ancient mathematical writings, tables showing average age of students in a college, illustrations of three- dimensional objects.
- **Informatics / information and communications technology:** screen shots of programs that are being described, flowcharts to show the steps in programming, pictures and illustrations of computers and information technology in everyday life

6. HOW CAN INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) CHANGE TLRs?

Using ICT

Over the recent years the Internet has grown and developed so as to make access to a growing range of TLRs to be available for all teachers around the world. This means that teachers and students are able to access many sources of information from the best of international practice.

Much of this information is free. However, some information found on the Internet is unreliable or put there by businesses who are promoting products or services rather than critically informing the reader. The addresses of good Internet sites can be given in TLRs or teachers' guides. Teachers and students can expand their knowledge of a subject by accessing and searching on the Internet.

The VET 1 project established a website to provide information and contact details and also to provide a content repository for teachers to share their teaching and learning resources amongst colleagues in Serbia. This content repository is operated within a Virtual Learning Environment called Moodle. There is a direct link to the Moodle component on the project website and all relevant users will be provided with user name and password credentials to be able to use and interact with the site.

The plan is to use the Moodle site as a means by which new teaching and learning materials can be provided to support the implementation of the new curricula before new textbooks and other TLRs are written. Teacher colleagues will be able to upload materials which they have found or produced themselves and which have proved to be useful to support the new curriculum. Equally, colleagues will be able to download materials.

The hope is that the Moodle site becomes a lively and vibrant on-line learning community. Teachers and learners will be able to interact on-line as well as originating, uploading and downloading materials in a content-rich virtual environment.

Electronic publishing

Electronic publishing is the process of using computer technology and the Internet to do the following:

- prepare text on a computer
- distribute text to and between colleges via telephone lines linking computers
- enable text to be read on computer screens

The advantages are

- it eliminates typesetting costs
- it eliminates printing, storage and distribution costs
- text can be instantly accessed where it is needed
- printed copies are made only when required

Advantages and essential conditions for electronic publishing

Web publishing	
Advantages	Essential conditions
Short time from author's writing to publishing	Authors and students need access to computers
Low cost (no paper and printing)	Cost of software and time
Easy to include colour, graphics, video and sound	Graphics and sound increase download time
Can be stored in compressed form	Availability of reliable telecommunications
Easy to make revisions and editing	
Can be used for continuous assessment of students	
The learning materials can easily be supplemented with additional activities for students or differing levels of ability	

CD ROM publishing	
Advantages	Essential conditions
Big capacity on disk allows colour graphics, video and sound	Computer availability
Quick access time	Machines need fast CD drive
Low cost of production and duplication	Assured distribution to all learners
Can be used for assessment	

7. What next?

This guide to writing TLRs has given you a rapid overview of the art and practice of writing for secondary vocational students. It has combined experience from both international and Serbian experts to help potential authors with the challenging task of helping to educate the next generation of learners in the technical schools.

A guide is not meant to be a set of laws to be followed rigidly. It is exactly what the word implies - a set of ideas and suggestions to guide aspiring authors through the early steps, their own persistence, talent and artistry must do the rest.