HOW TO MAKE DISTANCE LEARNING MORE EFFECTIVE THAN TRADITIONAL ONE

By Dr. Alexander Zelitchenko

Distance learning is trying to imitate traditional learning through teleconferencing. Naturally, this results in significant lost of effectiveness, which is not too high even in real classroom without imitation. The article develops alternative approach that allows making distance learning more effective than traditional one through individualization of learning. Some ideas of P.Ya. Galperin's theory of the Step-by-Step Development of Mental Actions are elaborated with the aim to develop didactic technology of individualized distance learning. The applications of approach are demonstrated on several examples including history, algebra and foreign language.

I. THEORETICAL INTRODUCTION

Individual Approach Is the Greatest Plus of Distance Learning

Pandemic, which will continue we do not know how long, demands shifting from traditional ("offline") learning to new online ("distance") one.

On this great challenge the educational system tries to respond with reproducing traditional lessons and traditional didactics through teleconferencing. Of course, this is difficult and often impossible. Beside the technical problems hinder progress here, pseudo-traditional learning through conferencing is less effective than traditional one.

This is a bad news. The good one is that there is the alternative approach, which promises better results and may be realized much simpler technically. Distance learning may become much more effective than traditional one without imitating the last. Moreover, this doesn't demand advanced technical systems – in principle, both teacher and students need only email clients.

Why? How? Because distance learning allows to **teach individually**. In traditional classroom teacher has no such option. Distance learning gives it. But "to give" is not enough – to get the possibility it is necessary to take it. And this is not simply in itself.

However, before discussing the didactic technology of distance learning we have to determine the main problem that lowers the effectiveness of traditional learning.

What Does Hinder Traditional Educational Process?

The answer is simple: a student is forced to study what (s)he is not prepared to learn. We cannot build the third floor of building if we finish only the first floor and even did not start constructing second one. In traditional education this is exactly what teacher tries: to build 14th floor in the building where only 2 floors were more or less completed and when he fails to hit the building for laziness and inability.

There are a lot of factors influencing easiness of how students learn. In traditional educational situation teacher cannot adopt himself to these differences and have to teach either "average student", or "majority of students", rarely – best students and never – worse ones. In distance

learning teacher can teach each student separately, building with one student his tenth floor with other her sixth one.

The Goal of Education - Skills

Before starting discussion of distance learning's didactics we have to determine the goal – the product this technology must produce.

With some simplification we may determine this goal as forming the set of skills. (I'm developing in this article some ideas of unfortunately almost unknown in the West the theory of the *Step-by-Step Development of Mental Actions* created by prominent Soviet psychologist, founder and chair of the departments of educational and developmental psychology of Moscow Lomonosov University Piotr Yakovlevich Galperin (1902-88)).

Why skill? Why not knowledge? Not personal trait? This is a complex topic, discussion of which would lead us in the depth of theoretical psychology far from the central topic of present paper, but I need to say at least few words about it.

First, knowledge manifests itself in skills. We see that a student knows something when he can do something, say to explain something, to solve some problem etc.

Second, knowledge is formed as a result of mental action, not as (as many non-psychologists believe) as simple imprint of what student sees or hears. Mental action is always manifestation of some mental skill (skill to act, to produce this action). Thus, speaking about forming knowledge we speak about the skill to form this knowledge and about the skill to use this knowledge. For example, we evaluate geographical knowledge through ability to show some geographical region on map. In fact, we evaluate the success of education through existence of skills to solve test problems.

The same is true in respect of personal traits, which also manifest themselves in action that demands some personal skills to be executed.

Allow me to limit discussion of this important matter here.

Structure of Skill

What is a skill? What are we going to form? A skill is a structure of simpler skills (including skills in form of knowledge, which determine the relationships between "parts" of skill), each of which is a structure of even simpler elementary skills and so on. Forming skill is like constructing building from big blocks, which consist from smaller blocks, which consist from even smaller blocks and so on down to smallest blocks, which consist of bricks.

There are two types of structure of skills – "horizontal" and "vertical". Skill with horizontal structure consists of combinations of numerous elementary skills that cannot be decomposed further. For example, linguistic skills composing phrases from words are horizontal because they are based on mastering many words, the more the better. Developing horizontal skill bases on expanding the set of elementary skills ("personal dictionary").

If horizontal structure is like building with few floors, vertical structure is multi-storey: components of complex skill are only a little less complex skills. Between high-level skill and elementary skill may

be 5-10 intermediary levels, each contains the skills of corresponding complexity. Many intellectual skills are vertical.

To construct building we need to possess all necessary blocks, and when some blocks, not important small or big, are absent we need first to make them. But to do this we need to know the structure of skill, starting from the set of sub-skills that form the skill.

Studying the structure of skill may be called decomposition of skill. This is not always simple problem. To solve it teacher must know the material very well. Unfortunately, this is not always a case. But in further discussion I propose that teacher knows the subject well. If not (s)he cannot become good distance teacher. Although to be a good traditional teacher s(he) cannot also.

Two Corner Stones of Distance Learning

These "stones" are: (a) decomposition (structuring) of the skill we are going to form (I'll call it "***goal-skill***") and drawing the map of goal-skill, and (b) testing what from the goal-skill's necessary blocks-skills are present and which are absent in mind of the student.

When all blocks are here the learning process consists of providing students with: (a) the scheme how the goal-skill is constructed from sub-skills and (b) the set of problems, solving which student builds the goal-skill, or using more professional language, interiorises the new skill making it semiautomatic.

When some necessary block is absent the goal of learning is shifted to forming the absent skill. This absent skill becomes goal-skill. Thus, teacher all times tests what skills are formed and what are not and forms the necessary but absent skills from those skills, which were formed already.

The usual situation in classroom is when one student needs one sub-skill to be formed, other student needs another sub-skill. (Often such unformed skills had to be formed years ago). To teach these two students together is not possible because they need to form different skills. Distance learning allows teaching these students separately. If the process is organized properly a teacher has time for this.

Thus, 2 things a teacher needs for distance learning are:

1) The map of goal-skill, and
2) The set of tests to determine what necessary sub-skills are formed and what are not.

Drawing such map is most important part of the process. Below we will consider several examples.

Technically the learning process is exchange of emails between teacher and students. Some of these emails include attachments – images, sounds or video files depending on the goal-skill and test tasks.

Of course, the approach is not absolutely universal and cannot be applied to forming such physical and/or social skills as playing basketball, but a lot of skills may be taught in this paradigm.

Some Other Positive Potentials of Distance Learning

1. Permanent control does not leave place for laziness. In traditional class student has a choice: to learn or not to learn. Teacher controls his progress sporadically: there is high probability that nothing bad will happen if I'll not do my homework. In distance learning when student and teacher exchange emails at least once per day, student *must* work.

2. There is no frustration. Comparing him(her)self with more advanced peers often may be traumatic forming negative self-evaluation. In distance learning a student does not compete with peer students but with himself: the progress is evaluated not comparing with other students but comparing with student's previous state of development. If today she decides the problem that she failed to decide yesterday this is an excellent mark, not important how easy or difficult the problem she decided for other students.

3. Forming positive motivation and productive social interaction. Although the educational technology allows teacher to work individually with relatively many students, this "relatively many" may be even increased if teacher delegates part of his teaching power in respect of some skill to peer student who already formed this skill. Such advanced student starts working as a teacher's assistant with her less advanced peers. In different subjects students may change the roles: in history John teaches Mary, in mathematics Mary John. Becoming/staying a teacher's assistant is a kind of award that motivates both more advanced students and less advanced ones.

But this is not the only advantage of making students teachers. Cooperation with peers in educational process forms a productive type of social communication, the values of education and helping other people as well as a whole set of important social skills.

II. EXAMPLES

Let us move from abstract theory to teaching practice. I consider 4 subjects: history, foreign language, mathematics and distance learning itself.

II.1. History (the topic – "Athens in 5th century BC")

The most obvious and universally reachable goal-skill here is the ability to tell with as more details as possible about the life of Athens in 5 century BC. Although more ambitious teacher may determine more ambitious goals (see below).

There are many block-skills that may participate in reaching this goal-skill. Some of them are universal and enter in every set of block-skills. For example:

> Knowledge of sources of historical knowledge and skill to use them;
>
> The ability to show on map Athens and some of its neighbours (in Greece - Sparta, Corinth, Thebes... abroad – Persia, Egypt, Phoenicia...);
>
> The knowledge of (skill to tell about) historical context: notion of Hellenic civilization and time span of its existence, what was before and after, what countries dominated culturally and politically, influences on ancient Greeks and influences of ancient Greek ("teachers" and "students" of Ancient Greece, small Greece and huge Persia, young Greece and old Egypt etc.

Knowledge of the relationships with neighbours (foreign states and Hellenic city-states near).

More specific knowledge includes:

Name of main actors – political, cultural;

Political organisation of society and law;

Everyday life: dishes, apparels etc;

Art: architecture, sculpture, painting, theatre, literature;

Philosophy and prescience;

Religion and beliefs;

Sport, Olympic Games;

Wars, weapons, armours...

The goal-skill here may be determined differently: wide by surface knowledge of all aspects of Athens's life or deeper knowledge of some specific aspects, say, the technology of building temples.

But in both cases *sub-skills* are same: the ability to tell about some aspect(s) of Athens's life in 5th century BC and the ability to extract knowledge from the sources (texts and material things).

More basic sub-skills (*sub-skills of sub-skills*) include the ability to collect historical information, to compare, to differ, to analyse, to extract meaning etc.

Even more basic ones (*sub-skills of sub-skills of sub-skills*) include the abilities to search for necessary information, to question, to read, to use Internet, to type...

The ambitious teachers may introduce another goal-skill – development of interest in history. Or even more common one – activating studying history. Moreover, the goal-skill may be formulated differently for different students. For one – knowledge (ability to tell) something, for other – ability to tell a lot about different aspects of life in 5th century BC, for third – ability to search for new and new knowledge, and so on.

Tests for checking the present state of historical competence are very simple and may be easily developed by each teacher. These are examples of questions (test items):

How many years are between 500 BC and 500 AD?

How many years ago did Socrates die if it happened in 399 BC?

How many kilometres are between Athens and Corinth?

Is Sparta located south-east of Athens?

Who is older – Plato or Socrates?

The test itself must be conducted differently, for example, with allowing using Internet. To prevent copy-paste of source teacher can limit field for answer on open questions (like "Tell what you know about red-figure pottery") - *not more than 500 characters*.

II.2. Foreign Language

To determine the goal-skill we need first to remember about 4 groups of language proficiency (language skills): listening, speaking, reading (with 2 subgroups – reading printed text and reading handwritten text) and writing (again with 2 subgroups – handwriting and typing).

Even in regard to native language these skills develop non-even: children start with listening (understanding speech) and continue through speaking and reading printed text to writing (traditionally first handwriting and later typing) and reading handwritten text. Writing is the most advanced skill and not too many native speakers are good native writers also. This order is changed when we learn foreign language where a person can read better than speak and speak better than listen.

The didactic here bases on hierarchy of linguistic skills.

The lowest level in this hierarchy includes:

Recognizing printed and handwritten letters (for reading);

Writing/typing letters;

Understanding and producing sound and printed words and simplest expressions like of introducing parties, greeting, farewell, expressing gratitude, asking permission or expressing sorry;

The grammar and pronunciation skills.

To this list one more group of extremely important skills must be added: the skills to improve own language proficiency, e.g. the skill to use Internet to enrich own dictionary.

The upper levels include abilities:

To understand more and more complex texts written and spoken by more and more different writers/speakers;

To speak and to write more and more complex texts himself, and

To solve more and more complex communicative tasks in more and more various communicative situations.

Mastering different words are relatively independent each of others and may be considered as skills of same level. But roles of different words in overall proficiency are different. The natural order of forming personal dictionary of foreign language is from most frequently used words as pronouns, numerals, question words, prepositions and interjections, names of days of week, months, geographical names (among most important nouns) and *to be, to hav*e and modal verbs (among most important verbs) to less frequently used words that includes most adjectives and adverbs.

The same is true in respect of expressions and grammar, where language units are more or less independent, but importance of their roles in communication changes from basic to exotic. Among most basic there are the skills of asking and answering as well as skill of understanding question.

The teacher has to know the language units, which each student understands when (s)he reads and/or listens the unit alone or in context of bigger text and which (s)he can speaks and handwrites/types. This determines the tasks, which teacher gives to students (like translate written or spoken dialog, or write own dialog with exchange 2, 3, 5, 10 questions-answers, or discuss with himself or with somebody else some topic and send teacher sound file with transcript etc).

Testing the present state of development has to be done permanently basing on the content of student emails. In case of doubts, students may be asked providing video of their work as a proof that they did not use Internet more than it was allowed.

To determine the goal-skills that corresponds student's proficiency, first teacher needs to introduce for student the communicative situation and communicative tasks. Some of such tasks, as understanding of received message, are universal and present in any communicative situation.

To test student's proficiency in understanding sound speech, teacher may email sound or video file with short speech where he determines the student's task – what student has to do. Student must reply on this email immediately (say, in 5 minutes) with confirmation how (s)he understood the task (such reply may be in student's native language or in studied language, written or sound). Replies like "Hi, Mrs. Johns; Sorry, I cannot understand you. Please reformulate (or please say more slowly)" are accepted as perfect ones. The skills to say such phrases are among the very basic conversational skills.

The classes of tasks (goal-skills) may include:

> Chatting with peers (classmates or native speakers);
>
> Search for information;
>
> Search for the good (e.g. bicycle in online shop) with reading customers' reviews and comparing different brands/models;
>
> Writing essay (from simplest topics like "What words of foreign language I know" to more complex like "What I ate for breakfast" and to any more complex depending on the student's language proficiency).

The example of the goal-skill for advanced students is a dialogue with classmate, which imitates dialogue between buyer and seller in the shop, where buyer asks about availability, price, features and quality of some goods.

Even more complex goal-skill may be the search for some specific thing in online shop (like Amazon), the price of which is not higher than, say, 200 Euro, with the final aim to convince some foundation to buy this thing. This goal-skill is decomposed in many sub-skills: reading the description and reviews, communicating on forum asking peers who own the thing their opinions, writing final report, which explains the advantages of chosen thing.

After the work is completed, student emails the report. The form of report (spoken or written) is determined by teacher. When necessary, teacher may ask video capture made for example with OBS Studio (https://obsproject.com/). Use of translation software like Google Translate (https://translate.google.com/) may be allowed or prohibited depending on didactic task.

One more the brief note about motivation. In our time teacher has the option to raise both motive and effectiveness of education by asking student to communicate with peers native speakers of studied language in social network providing screenshots as proofs of homework. It is well known that study of any subject becomes more effective when educational activity are included in broader context of "bigger" student's activity. For example, if Italian girl wants impressing American boy, her English will improve speeder than if she simply read textbook.

Appendix 1 shows the short program of learning Russian as foreign language not in school but in professional training for waiters.

II.3. Mathematics (topic – linear equations)

The goal-skill here is ability to resolve such equations. Most obvious sub-skills include multiplication and division of real numbers (practically, of course, rational numbers – those that may be represented as a quotient of division one integer by another, or expressions that include irrational numbers like square roots).

But in fact, mastering linear equations bases on understanding what *real number* is and what *function* and *equation* are. All 3 concepts are far from to be elementary and their forming is often connected with significant difficulties.

In traditional classroom the teacher simply shows the sequence of actions (say, transforming the equation to a form $ax+b=0$ if necessary, determining what a and b are, and enjoying the solution $x=-1*(b/a)$) and asks students to repeat. Students repeat but many of them do not understand clearly what they do. As result when they come to more complex problems (like systems of linear equations or trigonometric equations) they experience significant difficulties because their new actions must be formed from elementary actions that were not formed properly or were not formed at all. This is like you cannot multiply 2-figures integers if you was not learned to multiply 1-figures integers (1-9) ones (you did not interiorize multiplication table).

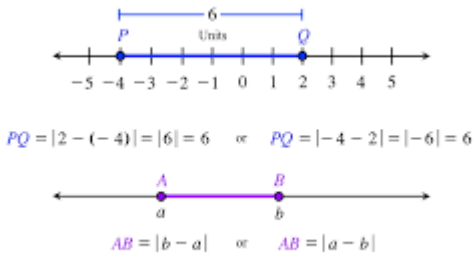
Thus, to go through this topic we must avoiding traditional simple method but spend some times to form at least partially the concepts *real numbers*, *function* and *equation*.

This is not the way how these concepts are formed usually from concrete manifestations to generalization: first students study how to deal with new for them and mysterious object "equation" and only after that realize the meaning of equations in term of functions (another mysterious object). The main problem with this "natural" way is that significant part of students does not develop these concepts at all and stops developing mathematical thinking completely and forever.

But if for traditional education teacher have no choice here, in online education he can spend some time to develop necessary skills-concepts that will facilitate further study of mathematics.

The concept ***real number*** is intuitively simple (as a distance between 2 points), but formally (as infinite decimal) may be extremely difficult to be formed since bases on another very difficult for forming pure abstract, having no prototype in real life, concept ***infinity***. The concept ***rational number*** may be formed instead as an *approximation* of distance between 2 points by natural number of parts of one unit of length (e.g. **1/*N***th part of 1 meter).

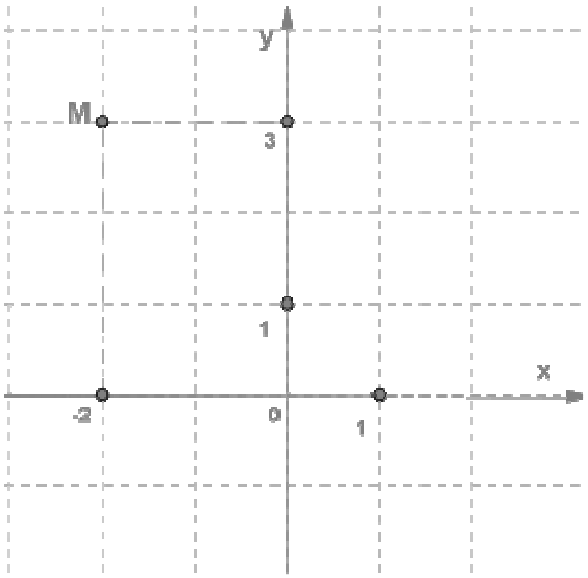
The problems, which students must resolve here to form these concepts, may be measuring the distance between 2 points (length of corresponding line segment) in some units of length, e.g. meters. Each student received the image of 2 line segments: the first is segment with length equal 1, the second is segment, the length of which must be determined, and instruction to measure the length of the second line segment as precisely as possible (the option: "not less than 2 digits after decimal point").



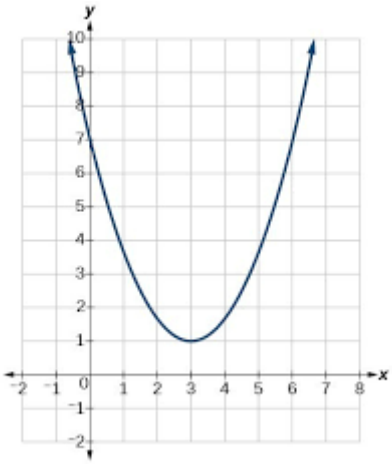
To form the concepts ***function*** and ***equation*** we need first to form (or at least to start forming) even more general concept ***mathematical object***. The examples of mathematical objects are 2 types of numbers (natural numbers – the measure of how many objects are in finite set; and real numbers – the measure of distance between 2 points). The other examples of mathematical objects are lines, shapes, surfaces and bodies. All these mathematical objects are intuitively understandable.

To introduce new mathematical object that is called ***function***, we may start with introducing the mathematical object ***pair of numbers***, not a single number but 2 numbers connected together in *pair*. The pair is written as (**a**,**b**), where both **a** and **b** are the numbers (natural or real, not important) – the mathematical objects that we already know.

If the single real number may be presented as a point on straight line (as in figure above), the *pair of numbers* (they are called also *vectors*) may be represented as point on plane with 2 coordinate axes ***x*** and ***y*** orthogonal one to other. The point M present the pair (-2,3) of its coordinates (the projection on axis X (-2) and the projection on axis Y (3) correspondingly).



The concept *function* may be introduced as a mathematical object in 2 ways. The first way: *functions* are not what we ***see*** but what we ***do*** – ***how we calculate one numbers from others***. The second way: functions are ***connections*** (or ***correspondence***, or ***relationships***) between two (in general, it may be more than two) numbers. As such correspondence a function may be represented as a line (*graph*) – set of points (that is set of *pairs of numbers*).



The problems students solve to form the concepts *function* and *equation* are constructing (drawing) graphs of different functions (linear, quadratic, reciprocal, exponential etc) by, say, 10-20 points.

After the necessary ("basic") concepts are formed at least partially, the concept of equation may be introduced as a new mathematical object, the object, which is a ***problem***: to find such number, the function of which is equals to known number (e.g. 0). Such problem is reverse to the problem to calculate function of number.

For both mathematical objects (*functions* and *equations*) operations of addition (including addition of real numbers) and multiplying by real number has to be introduced. The results of both operations are also functions (equations).

At this moment student may be asked to solve the test problems to check the state of developing concept-skills, which are necessary for forming goal-skill. The result may be considered as satisfactory when student may solve not only equation like $3x+5=7$, but equation like $ax+b=c+5$, where coefficients are expressions.

It is not necessary to say that this'll demands forming one more mathematical concept *expression*, which is close in some aspects to the concept *function*, but is different in other aspects. But allow me to leave this topic without further elaborating.

II.4. Distance learning (Instead of Conclusion)

The best way to demonstrate how this didactics works is to use it for forming ***your*** own goal-skill. We are starting here and will continue in online course.

This Goal-skill is ***didactic of distance learning with individual approach to each student through exchanging emails***.

Sub-skills:

1) Your ability to choose the topic of education inside your subject;
2) Your ability to determine the goal-skill that must be formed as a result of studying the topic;
3) Your ability to determine the system of sub-skills (knowledge) that the student has to possess to form the goal-skill;
4) Your ability to determine the sub-skills of sub-skills, sub-skills of sub-skills of sub-skills etc, which student has to possess to be able to form goal-skill;
5) Your ability to invent simple tests for checking the students' levels of development sub-skills in 3 and 4).

The problems to be solved:

1) Choose the topic of education inside your subject;
2) Determine the goal-skill that student forms as a result of studying the topic – what student cannot do now but will be able to do after education (not more than 500 characters);
3) Determine the system of sub-skills (knowledge) that the student has to possess to form the goal-skill (up to 10 main skills/knowledge; each is described on 1-2 short phrases);
4) Determine the sub-skills of sub-skills, sub-skills of sub-skills of sub-skills etc, which student has to possess to be able to form goal-skill (in the same way as above);

5) For at least 5 skills in 3) and 4) invent 2-5 simple tests (e.g. the questions with the limited number of alternative answers) for checking students' level of development sub-skills in 3) and 4).

Please email your work contact@higher-psychology.org with Subject "Learning Distance Learning". First 5 enrolled students will be taught free of charge.

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In Russian

https://ru.wikipedia.org/wiki/%D0%A2%D0%B5%D0%BE%D1%80%D0%B8%D1%8F_%D0%BF%D0%BB%D0%B0%D0%BD%D0%BE%D0%BC%D0%B5%D1%80%D0%BD%D0%BE-%D0%BF%D0%BE%D1%8D%D1%82%D0%B0%D0%BF%D0%BD%D0%BE%D0%B3%D0%BE_%D1%84%D0%BE%D1%80%D0%BC%D0%B8%D1%80%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D1%8F_%D1%83%D0%BC%D1%81%D1%82%D0%B2%D0%B5%D0%BD%D0%BD%D1%8B%D1%85_%D0%B4%D0%B5%D0%B9%D1%81%D1%82%D0%B2%D0%B8%D0%B9_%D0%B8_%D0%BF%D0%BE%D0%BD%D1%8F%D1%82%D0%B8%D0%B9

Appendix. Russian for foreigners (professional training waiters)

Introduction in Russian language

Alphabet. Phonetics. Complexness of grammar. Syntax - structure of phrase. Key words and phrases: nouns, pronouns, verbs, adjectives. Communicative situations and communicative acts. Examples. What is polite and what is not polite.

Greetings, farewell, introducing, thanks, sorry etc. Numerals.

Different forms are used in different situations.

Working situations

First contact. Self-introducing. Explanation of your level of mastering Russian. Suggestion to choose table. Offering list (menu). Offering drink. Suggestion to explain the items of menu.

Ordering. Dialogue clarifying the order – mode of cooking, side dishes etc. Explaining time of waiting. Recommending.

Serving. "Sorry for long waiting". "Bon appetite". "This is for young gentleman" etc.

Querying is it everything right? Handling complaints.

Additional order (dessert etc). Explanation of available choices.

Billing. "Cash, Card, or Sign on room?", "One minute!" Explanation of bill. Handling possible complaints.

Payment. "Please enter your PIN". "Please wait for the change". "Thank you for tipping" etc.

Farewell. "Thank for visit", "Are you happy with us?", "What we can improve?", "How do you like our city?", "Please come again", "Good night" etc.

Advanced elements

Description of dishes and drinks. Answering question "What is it (fondu, raclette etc)?".

Guiding. Answering question "What do you advise to see?"