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The Prominent Student Competences of the 21st Century Education and the Transformation of Classroom Assessment

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Abstract

The term of 21st century skills has become a key concept in the field of education. It has attracted researchers' attentions and included in some of the cognitive taxonomies used in the fields of curriculum development and educational assessment. In the 21st century, the teaching curriculum and instruction have started to transform in a way consistent with the change of the targeted competences that an educated person should have. This requires classroom assessment applications to change so that they can be in line with the nature of these competences and support their development. This study discusses the skills that have gained importance in the 21st century education (21st century skills), the interaction between these skills and the classroom assessment, and the transformation of assessment activities to cover these skills. The study also includes one sample assessment activity and rubrics that are developed by the researchers in order to guide teachers how to include these skills in their daily teaching plan and how to assess them.

Keywords: Student achievement, classroom assessment, higher order thinking skills, assessing the 21st century skills, metacognition, conative skills

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Introduction

Recently, many countries believing that education is a propelling power for the development of countries have been questioning the success of the schooling in raising the standards of learning. They have started to find the achievement criteria defined as "the level of accomplishing learning outcomes" as very result-oriented. They accept that individuals' not being able to apply their knowledge to the real-life situations is an important failure of schooling. Schools are still not qualified and equipped enough to develop students' higher order thinking skills. This has become the propelling power behind the national education ministries' movement of transforming the information-oriented curriculum to the skill-oriented curriculum. Applying fundamental knowledge acquired at schools to real life requires students not only to have cognitive skills, such as comprehending, problem solving, critical and creative thinking, but also to have various conative, social, and meta-cognitive skills (Haladyna, 1997; Kutlu, Doğan, Karakaya, 2014).

Especially since the 1980s, using findings of the cognitive psychology for developing the curriculum, teaching methods and techniques, and educational assessment applications at schools has gained wide currency. The behaviorism that has maintained its impact on education for long years has been replaced by the constructivism. Thanks to this, developing higher order thinking skills that require students to use various cognitive, affective and psychomotor skills simultaneously has recently stood out.

Many researchers argue that the development of higher order thinking skills is dependent on enabling students to use cognitive, meta-cognitive, conative and social skills simultaneously. Related studies provide results supporting the appropriateness of this idea of the researchers. Studies reveal that it is necessary to enable students to produce an output by using his/her cognitive, meta-cognitive and social skills so as to develop their higher order thinking skills (Grolnick & Ryan, 1987; Haladyna, 1997; Marzano, 1992; Strayhorn, 2013; Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011; Kutlu, Kula-Kartal & Şimşek, 2017; Kula-Kartal & Kutlu, 2017). Recently, this understanding based on students' simultaneous use of three-domain skills while creating a product or an output has affected the definitions of the 21st century skills and ongoing discussions on this issue.

The 21st Century Skills

The term of 21st century skills has become a key concept in the field of education. Cognitive skills, such as problem solving, reasoning, critical and creative thinking; meta-cognitive and conative skills, such as persistence, self-efficacy, motivation, openness to problem solving; social skills, such as collaboration, communication, taking responsibility all fall under this key concept. These competences are not discovered within this century. Yet, the importance given to the rote and superficial learning has decreased. On the other hand, the importance given to the cognitive processing of the information based on the background knowledge and the personal experiences have increased within this century. The rapid changes and problems happening in the inter-cultural relations, in the social relations and in the natural environment inevitably have increased the importance given to these competences. Today, in the field of education, it is frequently stated that students should accomplish the 21st century skills. They should graduate from their schools as skilled individuals in utilizing these competences to solve their real-life problems (Pellegrino, 1999; Greiff & Kyllonen, 2016).

Recently, the 21st century skills have increasingly attracted researchers' attentions. They are even included in some of the cognitive taxonomies used in the fields of curriculum development and educational assessment. For example, the skills affecting learning are divided into two dimensions by Marzano and Heflebower (2012). One of them includes cognitive skills, the other one comprises of skills of understanding and controlling the self and the others. Marzano, Pickering and McTighe (1993) argue that students' attitudes and meta-cognitive skills are the two fundamental dimensions of learning. Marzano (1992) states that these dimensions have important effects on learning, and provide basis for learning. Marzano and Kendall (2007) divide individuals' cognitive activities into three

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categories; the self-system, the meta-cognitive system and the cognitive system. Individual's self-system decides whether the individual is going to engage with a new task. In addition, it determines the amount of time and effort that the individual will separate to accomplish the task, if the individual prefers to engage with the new task. Ruiz-Primo (2009) divides competences that should be taught and assessed in the field of science education into three dimensions; intra-personal skills, cognitive skills, and scientific skills. International large-scale assessments also focus on some intrapersonal skills. For example, students' instrumental motivation, self-efficacy, persistence, openness to problem solving, school engagement, internal locus of control were assessed in the Program for International Student Assessment (PISA) conducted in 2012 and 2015 (OECD, 2013; 2016).

Although there is not only one scheme on which all researchers comprise, various frames have been developed in order to summarize these skills within a well-organized content (Kyllonen, 2015). The frame developed by Colloborative for Academic, Social, and Emotional Learning (CASEL) includes the five main competency dimensions; self-awareness, self-management, social awareness, relationship skills and responsible decision making (Weissberg & Cascarino, 2013). National Research Council (NRC) has also carried out studies aiming to define the 21st century skills. In the related report (NRC, 2010), the 21st century skills were divided into five dimensions; adaptability, communication-social skills, non-routine problem solving, self-management and systems thinking. However, in the report published after 3rd workshop held on these skills (NRC, 2011), the 21st century skills were divided into three dimensions. The dimensions of self-management and adaptability were brought together under the dimension of intra-personal skills, the dimensions of systems thinking and non-routine problem solving were brought together under the dimension of cognitive skills, and the dimension of interpersonal skills included communication-social skills.

Klein, DeRouin and Salas (2006 as cited in NRC, 2011) define interpersonal skills as goal-oriented behaviors that are used for the interpersonal communication determined by complex perceptional and cognitive processes, and include communication-relationship skills, various verbal or nonverbal messages, roles, motivations and expectations. The researchers also divide interpersonal skills into the two sub-dimensions that are called as communication skills and relationship skills. These sub-dimensions include skills, such as sending verbal messages constructively, writing clearly, expressing one's feelings, preferences, and opinions in a way that is not threatening or punishing to another person, appreciating differences among people, influencing others' ideas and reactions, managing others' impressions to create a positive influence on them.

Furthermore, in the frame developed by NRC, adaptability and self-management skills are brought together under the dimension of intrapersonal skills. This dimension includes skills, such as adapting actions effectively to cope with rapidly changing situations, being willing to learn new tasks, techniques or technologies, rapidly orienting to new processes or applications, accomplishing tasks without needing any external control and by following idiosyncratic ways to accomplish the tasks, setting personal goals and pursuing for these goals, managing time (NRC, 2011).

The 21st Century Skills and The Classroom Assessment

In the 21st century, curriculum, instruction and classroom atmosphere have all started to transform in a way consistent with the change of the targeted competences that an educated person should have. This requires classroom assessment applications to change so that they can be in line with the nature of these competences and support their development (Stiggins, 2002; 2005). Stiggins (2002) argues that a new point of view for classroom assessment should be developed, if it is aimed to connect assessment applications and the improvement of schooling. Researcher thinks that educational measurement specialists have firstly focused on exploring and improving new methods and techniques to obtain more reliable and valid scores. Meanwhile, the important question of "how do our assessment tools contribute to students' self-efficacy and willing to learn?" has been left unanswered.

Search for the answer to the question of how to enable consistency between the targeted competences in the curriculum and the classroom assessment approach has increased interest in the

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formative assessment. It is possible to mention two different approaches for formative assessment. First of these approaches is ***assessment of learning*** that is based on testing students more frequently by increasing the frequency of summative assessments and getting more information regarding students' development. That kind of assessment approach provides more evidences and information regarding the efficacy of curriculum and instruction. However, it cannot be effective in increasing students' motivation to learn and achievement because assessment is mostly applied after completion of the learning process. In addition, these frequent assessment applications still cannot provide the necessary information needed by teachers for day-to-day, or even hour-to-hour instructional decisions. The second approach to the formative assessment is called as ***assessment for learning***. It includes more than testing students frequently. In this approach, instruction and assessment are indivisible. They progress in an interactive way and inform each other. Students are also informed about their own learning and engaged in their own learning processes thorough self-assessment (Black & William, 1998; Stiggins, 2002; 2005).

A teacher who embraces the assessment for learning approach a) specifies the achievement targets to be mastered for every class clearly and in a student-friendly way, b) shares these targets with students from the right beginning of the class and helps them understand what are expected from them, c) teaches students these targets by using models of strong or weak work to help students understand expectations more clearly, d) assesses students' level of accomplishing targets of the class by applying an assessment activity that is consistent with the learning targets, e) guides students to help them assess their own learning based on specific learning targets, f) helps students identify the learning gaps that need improvement by providing students with descriptive feedback, g) creates second chances during the class to enable students to make the necessary changes on their works (Moss & Brookhart, 2009; 2015).

The assessment for learning approach affects students' intrapersonal skills since it provides students with necessary tools that are needed by them during their learning processes (Brookhart & DeVoge, 1999; Black & William, 1998; Brookhart & Durkin, 2003; Greenstein, 2010; Gordon & Rajagopalan, 2016; Popham, 2017). In a classroom in which this assessment approach is applied, clear and student-friendly version of the learning targets are shared with students because students can assess themselves only when they have a clear picture of the targets. In addition, assessment activities are planned specific to these targets for every class. Teachers use sample works to make sure that students already understood all expectations before applying the assessment activity. Therefore, the criteria that students can take into consideration to monitor their own progress become clear for them. So, students can assess their own learning processes based on these clearly defined and shared learning targets. They can also specify what to do next to improve the quality of their work thanks to teacher's and their own feedbacks. Students have a chance to identify their inadequacies not after completion of the class, but while they are still in the learning process. They are continuously informed about their next steps. That kind of assessment approach provides students with the support, information and atmosphere that they need to overcome their inadequacies and develop their skills (Black & William, 1998; Moss & Brookhart, 2009; 2015).

When one aims to develop students' 21st century skills, it gains importance to embrace an assessment approach that is consistent with the nature of these skills and that can support the development of these skills. It is very important to have consistency between the targeted skills and the indirect messages sent students via the assessment approach. This consistency can be accomplished when teachers embrace the assessment for learning approach and apply this understanding effectively in their classrooms. In this approach, students do not try to learn within a classroom atmosphere in which they are punished or awarded for their wrong or correct answers. On the contrary, student is inside of a learning process during which his or her inadequacies are revealed thanks to continuous and personalized feedbacks. The student is allowed to reach deeper and sophisticated learning by using these feedbacks. Within this classroom atmosphere, student can only focus on mastering targeted skills without feeling any anxiety for performing better than the others or being punished because of mistakes.

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As mentioned before, the change of competences needed by individuals in the work life and the findings of the cognitive psychology regarding the skills affecting individuals' learning processes have made important changes on the definitions of education and educated person. Accordingly, these changes have caused to transform schools, the curriculum and instruction methods. While necessary transformation happened more rapidly in these areas, the effect of behavioristic approach on the classroom measurement and assessment applications lasted a long time. Educational assessment failed in fitting those changes happening in the fields of cognitive psychology and education until the 1980s (Gordon & Rajagopalan, 2016).

According to Pellegrino (1999) these developments have recently started to change educational assessment applications so that they can be more related to the learning processes and the learning environment of students. According to the researcher, tests that are weakly linked to the learning experiences of students and results of the assessment applications including tasks disconnected from the learning process and context are not valid any more. Similarly, Bennett (2014) argues that it will be necessary to change the educational assessment applications and its content as long as the definition and qualities of educated person changes.

Teachers' understanding of the assessment and their ways of using assessment in their classrooms need to be changed (Shepard, 2000). Behind that change, there are two important points that should be taken into consideration. The first of them is to embrace the assessment for learning approach. The second one is to assess students' intrapersonal and interpersonal skills in addition to their cognitive skills. These changes indicate the necessity of forming and applying new instruction and assessment models based on the assessment for learning approach. Furthermore, it is necessary to use items or tasks that can enable to assess students' cognitive, intrapersonal and interpersonal skills. Therefore, focusing on the 21st century skills in the classroom assessment applications, continuously monitoring students' development in terms of these skills, and using items or tasks that enable them to monitor these skills have recently gained importance.

The two questions are important for reconstructing the curriculum and the classroom assessment: "What purposes do cognitive skills acquired by students at schools serve in their lives?", "Where and how do students utilize these skills in their daily lives?" When answers to these questions are considered, the importance of teaching and assessing students' intrapersonal and interpersonal skills in addition to their cognitive skills, become clear because almost all real life situations require students to simultaneously use various skills. Therefore, it is necessary to define intrapersonal and interpersonal skills that students need in their daily lives. In addition, the classroom teaching activities and the assessment applications should both be reconstructed based on these definitions.

In the following of the report, a sample task showing how to take the related cognitive, intrapersonal and interpersonal learning targets within a related and inclusive context. Scoring rubrics and evaluation forms showing how to evaluate students' works and give feedback to their products are also given in the following of the report. The sample task, the rubric and evaluation forms were developed by the researchers.

The Information Regarding the Sample Assessment Task

This sample task is prepared for eight graders to be used to assess students in terms of some learning targets of Math course. Within a class, it is aimed to teach students information and skills related to "budgeting" and "using money for shopping." Firstly, related skills are defined under three main dimensions; cognitive, intrapersonal and interpersonal skills. These skills form basis both for the classroom instruction activities and the assessment applications.

"Budgeting" and "using money for shopping" are skills that can be transferred and applied to individuals' daily lives. One area in which those skills can be used might be organizing dinner for friends. The task is related to organizing cost-effective dinner for friends. An individual organizing dinner should also use cognitive skills, such as defining criteria, making decisions, and justifying.

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Student is going to use some intrapersonal and interpersonal skills while organizing dinner, so skills such as time scheduling, coping with the possible problems and openness to problem solving are defined as intrapersonal skills within the frame of this task. Furthermore, this task also requires students to use some interpersonal skills like communication, working with the group, attracting interest and being hospitable.

Firstly, cognitive, intrapersonal and interpersonal skills that students need to accomplish the task are given in the following. Right after that, a performance task requiring students to use these skills, scoring rubrics that can be used to evaluate students' work are given. Students can be given feedbacks based on the results obtained from all of these evaluation forms.

The Sample Task: Organizing Dinner

8th Grade Math

Learning target 1: Budgeting

Learning target 2: Using money for shopping

Performance Task: Student organizes a cost-effective dinner for friends.

The Necessary Skills to Accomplish the Related Learning Targets		
Cognitive Skills	Intrapersonal Skills	Interpersonal Skills
Using money for shopping *Using four operations* Using addition, subtraction, multiplication, and division to solve problems. *Budgeting*: Planning how to use resources so as to satisfy the expectations and accomplish specific aims. **Decision making based on the data** *Identifying the criteria*: Specifying the standards that will lead to the most appropriate judgment. *Decision making:* Making a judgment by comparing available data with the defined criteria. **Justifying decisions** *Justifying*: Making casual and rational explanations for the results or the ideas.	**Time scheduling** Preparing a time schedule by taking into consideration personal capacity, priorities and base time. **Coping with the problems** Effectively adapting plans, targets, actions or priorities so as to cope with uncertain, unpredictable and rapidly changing situations. **Openness to problem solving** Thinking on alternative solutions by searching, criticizing and without being overwhelmed by prejudices.	**Communication** Expressing information, feelings, experiences and opinions in groups, understanding each other **Working with groups** All actions done by several students (group of 3 to 5 students) together so as to accomplish a study/task. **Attracting attention** Gathering others' attentions on his/her actions. **Being hospitable** Being nice to the guests and entertaining them.

The Classroom Assessment Activity

As a group of three including you and your two friends, you are responsible for organizing a dinner for a group of eight including your classmates. You are given 10 days to get ready for this organization. It is your group's responsibility to make decisions regarding a dinner menu, make a budget, buy foods, select venue, cook, set an attractive dinner table, welcome and entertain guests.

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As a group, you are expected to prepare a detailed plan for the dinner organization including following dimensions.

1) Preparing a creative dinner menu.
2) Spending at most 50 liras for one guest.
3) Showing the consistency between the dinner menu and the shopping expenses.
4) Selecting an appropriate place for dinner.
5) Preparing a time schedule.
6) Specifying the possible problems you might have during the organization and offering solutions to these problems
7) Planning the event night in detail.

Points to Consider

1) You should prepare at most five-page plan.
2) Your plan should include all your preparations you have done under 7 dimensions given above.
3) You should make the ideas behind all your preparations clear in your plan.

Your plan is going to be evaluated in terms of the following criteria,

1) The use of four operations and budgeting knowledge
2) The ability of building creative and attractive opinions
3) Expressing all plans in detail
4) Aligning the menu to the budget
5) The veridicality of time schedule
6) The ability of detecting problems and offering solutions.
7) The ability of communication and cooperation in group

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The Analytic Scoring Rubric

Student's Name: . . . . . .

Criteria	Levels of Achievement				Score	Opinions and suggestions
	Beginning(1)	**Developing(2)**	**Accomplished(3)**	**Exemplary(4)**		
Preparing Budget	The budget is hardly planned to accomplish the task.	The budget is partially planned to accomplish the task.	The budget is planned well enough to accomplish the task.	The budget is completely planned to accomplish the task.		
Scheduling time	The task is applied in a way hardly consistent with the time schedule.	The task is applied in a way partially consistent with the time schedule.	The task is applied in a way mostly consistent with the time schedule.	The task is applied in a way completely consistent with the time schedule.		
Attractive ness	The task is hardly attractive in terms of the menu and the table setting.	The task is slightly attractive in terms of the menu and the table setting.	The task is mostly attractive in terms of the menu and the table setting.	The task is completely attractive in terms of the menu and the table setting.		
Detecting Problems	Possible problems that might be experienced are hardly detected.	Few possible problems that might be experienced are detected.	Most of the possible problems that might be experienced are detected.	All of the possible problems that might be experienced are detected.		
Offering Solutions to the Problems	Hardly any solutions to the possible problems are offered.	Solutions to few possible problems are offered.	Solutions to most of the possible problems are offered.	Solutions to all of the possible problems are offered.		
Planning the Event Night	The activities, the playlist or the conversation topics are hardly planned for the event night.	The activities, the playlist or the conversation topics are slightly planned for the event night.	The activities, the playlist or the conversation topics are planned in a creative way for the event night.	The activities, the playlist or the conversation topics are planned in a very creative way for the event night.		

Teacher's Comment:

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The Self- Evaluation Form

Student's Name: . . . . . .
Student's Class: . . . . . **Student's School ID Number:** . . . . . .
Dear Students,
The following expressions are designed to learn your opinions and feelings regarding the dinner invitation you planned as a group. Please respond to each of the expressions using the 3-point scale (Slightly true of me, Moderately true of me, Very true of me) to describe to what extent this expression reflects you. Please respond to all of the expressions.

Expressions	**Slightly true of me (1)**	**Moderately true of me (2)**	**Very true of me (3)**
I made a preliminary study for the task when I first got the task.			
I am glad that I got this task and worked on it.			
I realized that good planning is a key to the accomplishment on this task.			
I participated in the task with great interest.			
I obtained new and important information from this task.			
I carried out the task in collaboration with my group.			
I accomplished all my duties and responsibilities for the task.			

Note: Please respond to the following questions based on your own opinions.

1. What did this task enable you to notice about "planned study"?

……..
……..
……..

2. Which part of the task caused you to have the most difficulty in accomplishing? Why?

……..
……..
……..

3. What are the positive and negative sides of working in a group on this task? Why?

……..
……..
……..

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The Group Evaluation Form

The aim of this evaluation is to specify strengths and weaknesses of your group work and provide feedback to you. Please evaluate yourself and your teammates using the following scale.

1: Developing (The work meets few criteria.)

2: Accomplished (The work meets most criteria.)

3: Exemplary (The work meets all criteria.)

The Criteria	**Name of the Group Member**		
	You	**....**	**....**
Group Work He/she accomplished his/her responsibility to the task, and supported the group to complete the task successfully.	1 □ 2 □ 3 □	1 □ 2 □ 3 □	1 □ 2 □ 3 □
Willingness and Effort He/she participated in group meetings on time and preparedly, volunteered for various tasks, and provided recommendations for the works that are not his or her responsibility.	1 □ 2 □ 3 □	1 □ 2 □ 3 □	1 □ 2 □ 3 □
Team Behavior He/she respected teammates, contributed to the new opinions and ideas, avoided behaviors that might humiliate teammates.	1 □ 2 □ 3 □	1 □ 2 □ 3 □	1 □ 2 □ 3 □
Communication He/she gave importance to group decisions, communicated well with the group, promptly brought up his/her concerns regarding the group problems, exchanged and shared information, emotion and experience with his/her teammates.	1 □ 2 □ 3 □	1 □ 2 □ 3 □	1 □ 2 □ 3 □
Problem Solving He/she predicted the possible problems, found appropriate ways to solve the problems, acted an effective part in solving problems, had positive approach to new and original solutions.	1 □ 2 □ 3 □	1 □ 2 □ 3 □	1 □ 2 □ 3 □

***Comments*:** ……

……..……

……...

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The Feedback Form

Teacher's Opinion			Levels of Competence	Student's Opinion		
Weak	**Progressing**	**Mastery**		**Weak**	**Progressing**	**Mastery**
			Cognitive Skills			
			Student takes into consideration all the information/points needed in the task.			
			Student writes the criteria that he/she takes into consideration while preparing the budget.			
			Student justifies his decisions based on the related criteria.			
			Student creates a detailed and appropriate budget.			
			Student shows the consistency between the decisions (regarding the menu, shopping and selection of venue) and the budget.			
			Student detects the possible person or group level problems.			
			Student offers creative and appropriate solutions to the possible problems. ,			
***Opinions and suggestions*:**				***Opinions and suggestions*:**		
Weak	**Progressing**	**Mastery**	**Interpersonal Skills**	**Weak**	**Progressing**	**Mastery**
			Students works in collaboration with each other and reflect this in their task report through their work-sharing.			
			Students share works by taking into consideration group members' characteristics.			
			Students take group members' opinions related to the problems and make a group decision.			
***Opinions and suggestions*:**				***Opinions and suggestions*:**		
Weak	**Progressing**	**Mastery**	**Intrapersonal Skills**	**Weak**	**Progressing**	**Mastery**
			Student effectively plans the time given for preparation and reflects this in the time schedule.			
			Student adapts plans, actions and priorities based on the possible problems so as to cope with the changing situations.			
***Opinions and suggestions*:**				***Opinions and suggestions*:**		

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