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Proximal Processes While Problem Solving in Formal and Game Environments

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Abstract

Problem solving follows a cycle of inquiry where the individual iterates between finding possible paths and exploring their likely effectiveness before selecting one as a possible solution. The cycle is enhanced through proximal processes because the number of paths that can be explored in depth are greater when more people work on the same problem. This paper discusses the cognitive aspects of problem solving, how proximal processes, specifically collaborations, affect problem solving, and how proximal processes work in formal and game problem solving environments. The primary finding is that proximal processes benefit problem solving mostly by providing explanations, but only when the collaboration is structured so that a lesser-skilled participant in the collaboration is explaining to a higher-skilled participant. This finding is common to both formal and game environments.

Keywords: proximal processes, problem solving, collaboration.

1. Introduction

Current curricular frameworks are emphasizing the need for students to learn how to communicate and work collaboratively because the problems that they will face as adults are too complex for one person alone to solve. The Partnership for 21st Century Learning (2015) places communication and collaboration equal to critical thinking skills as necessary for learning and innovation. Both the *ELA Anchor Standards* and the *Mathematics Practice Standards* in the *Common Core State Standards* list speaking to, listening to, and reasoning with others as essential skills for critical thinking in language arts and mathematics (National Governors Association Center for Best Practices, & Council of Chief State School Officers, 2010). These and other frameworks suggest that proximal processes are essential for successful problem solving, but (1) what are the characteristics of these proximal processes, and (2) how do they affect problem solving?

An additional aspect to consider is problem solving as it relates to context. James Gee argues that serious games are natural environments for both problem solving scenarios and proximal processes, but school is not. In serious games, players interact with other players and/or non-player characters in order to gain skills, resources, and possible solutions for the problems presented in the game. Additionally, players form affinity spaces, which are networks of other people with like interests for the purposes of sharing information, mentoring, and extending the game world beyond its original design (Gee, 2007). School, however, still relies on individual effort and assessment. The primary flow of information is linear rather than networked; policies inform

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teachers what knowledge is valued, which teachers then pass to students (Gee, 2013). Yet as the curricular frameworks suggest, peer-collaboration may be increasing in schools as teachers and policies seek to implement these standards effectively. Workplaces have followed a similar transition over the past twenty years (Partnership for 21st Century Learning, 2015). These changes suggest a third question: (3) How do proximal processes work in formal versus gaming environments?

- Collaborative problem solving uses the same process as individual problem solving.
- Individual skills increase when participants provide explanations to each other.
- Group skills increase when participants are willing to take risks.
- The group's social skills have greater impact than individuals' social skills.
- Games are natural environments for developing group and individual skills.

This paper will explore the research on collaboration and problem solving as a start towards answering these questions. First, individual approaches towards problem solving will be described as a foundation for the rest of the discussions. This foundation will then be applied to the research on how collaboration impacts problem solving. To compare proximal processes in formal and gaming environments, this paper will then review the research on collaboration in these spaces. Articles were found using Academic Search Complete, Education Full Text, ERIC, and Google Scholar and included proximal processes, problem solving, cognition, games/gamers, collaboration, and epistemology as search terms. Although the searches resulted in hundreds of articles, only ten addressed collaboration and its impact on problem solving, and only thirteen addressed how problem solving and collaboration combined in school, work, or games. The remaining articles addressed tools that could measure problem solving or collaboration, interventions to increase one or the other, effects on creativity or motivation, deficits with specific populations such as criminals, or the need to combine problem solving with inter-agency collaboration for specific scenarios and so were not included in this review.

2. Cognitive aspects of problem solving

A person has a problem if the person wants a solution but does not have one (Goldman, 1983). These problems may be convergent (goal is known) or divergent (goal is not known or unclear) and may have one or multiple paths towards a solution (Zhong, Wang & Chiew, 2010). The act of problem solving is both overt and internal; an individual will gather information (overt) and apply it to an inquiry process (internal) (Goldman, 1983). Zhong et al. (2010) describe these as external and internal worlds that work together to form mental models of the problem. The real entities of the external world are visualized internally as virtual entities, which are then represented as abstract objects so relationships between them may be explored internally. When the relationships are weak, which happens when the person lacks experience with a similar problem or scenario, other abstract objects are derived in order to determine if those have relationships which might apply to the current real problem.

The inquiry process consists of generating a hypothesis, pursuit of possible solution paths, mentally testing one of the possibilities, and making a decision (Goldman, 1983). Cognitively, the person identifies objects and attributes, explores possible approaches by considering alternate goals and paths, evaluates one of these approaches, and either repeats the process or represents the chosen approach in order to apply it to the current problem (Zhang et al., 2010, see Figure 1). Therefore, problem solving is a process of search and represent (Zhang et al., 2010). This process, however, is greatly influenced by how the information is presented to the person because cognitively the person begins selecting possible solution paths based on the first information presented (Goldman, 1983), which affects what the person considers appropriate for changing the situation and determining success (Zhang et al., 2010). This influence of presentation

and representation happens because people generally want only one solution to a problem even when multiple solutions exist (Goldman, 1983).
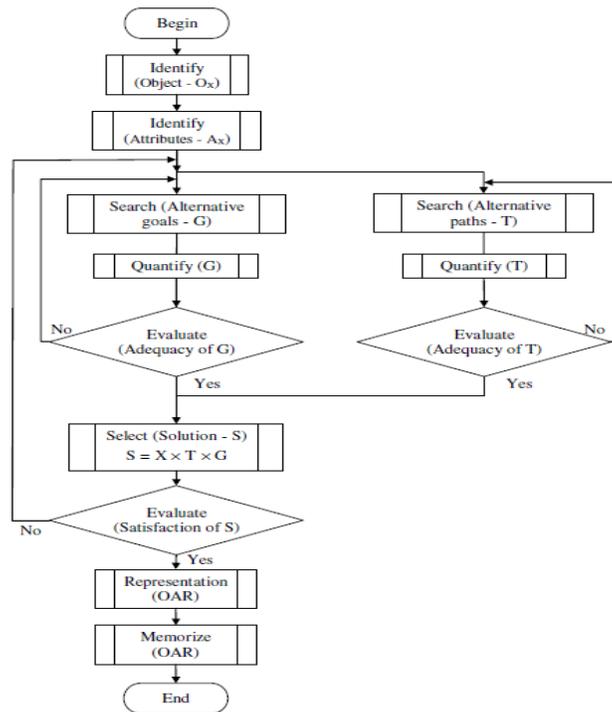

Figure 1. A cognitive model of the inquiry process (Zhang et al., 2010)

Another factor that influences the inquiry process is the level of experience the person has with the scenario. Bilalic, McLead and Gobet (2009) studied expert chess players in order to understand how experience with a particular board state affected the way they strategized in the game. Strategizing in chess generally consists of studying the current board state and hypothesizing the opponent's reaction to the various actions open to the player. Each action-reaction visualization is known as seeing a move ahead. In previous work, they learned that there are two approaches a player can use when strategizing: One can explore several possibilities for only a couple of moves ahead or one can explore one possibility for several moves ahead. Each carries risk; a shallow search may not reveal a difficulty further along the path but an in-depth search wastes time and resources if it is the wrong path. The expert player minimizes risk by applying the current board state to past experience, thus reducing the number of paths she will consider and allowing each to be explored in more depth.

For this study, Bilalic, McLead and Gobet (2009) determined the category of the specialization of each player (French defense or Sicilian defense) then presented each with four different board states: one in their area of specialization, one in the other area of specialization, one that favored neither category, and one that was a random placement of pieces on the board. They found that players had the easiest time recalling board positions for their area of specialization and the most difficult time recalling the random placement. Similarly, each player chose an in-depth search when in their area of specialty and a several-but-shallow search for all other board states. This suggests that the more experience one has with a problem, the easier it is to eliminate incorrect solution paths, allowing more cognitive resources to be used for internal representation. If one lacks sufficient experience, however, would proximal processes be an effective substitution?

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3. Collaboration and problem solving

Warner, Letsky and Cowen (2005) proposed a model of the group and individual cognitive processes at various stages of collaboration. As Figure 2 shows, these stages are knowledge construction, collaborative team problem solving, team consensus, and evaluation/revision. The knowledge construction stage is similar to the overt/internal problem solving activity that Goldman (1983) describes for individuals; even though people are working together, at this stage individuals are gathering data and building mental models to represent the problem. During the problem solving stage, these individual knowledge bases are integrated to form group-wide understanding and to begin the exploration of possible solutions. This alters the individual mental models to match the shared understanding of the problem and allows each member to explore a smaller number of possible solution paths in greater depth while collectively ensuring that a larger breadth of possible paths are explored. During the team consensus stage, individuals negotiate the possibilities they explored to collectively agree on a solution. Finally, during evaluation and revision the solution is collectively analyzed to determine if it matches the team's goals or if adjustments are needed.
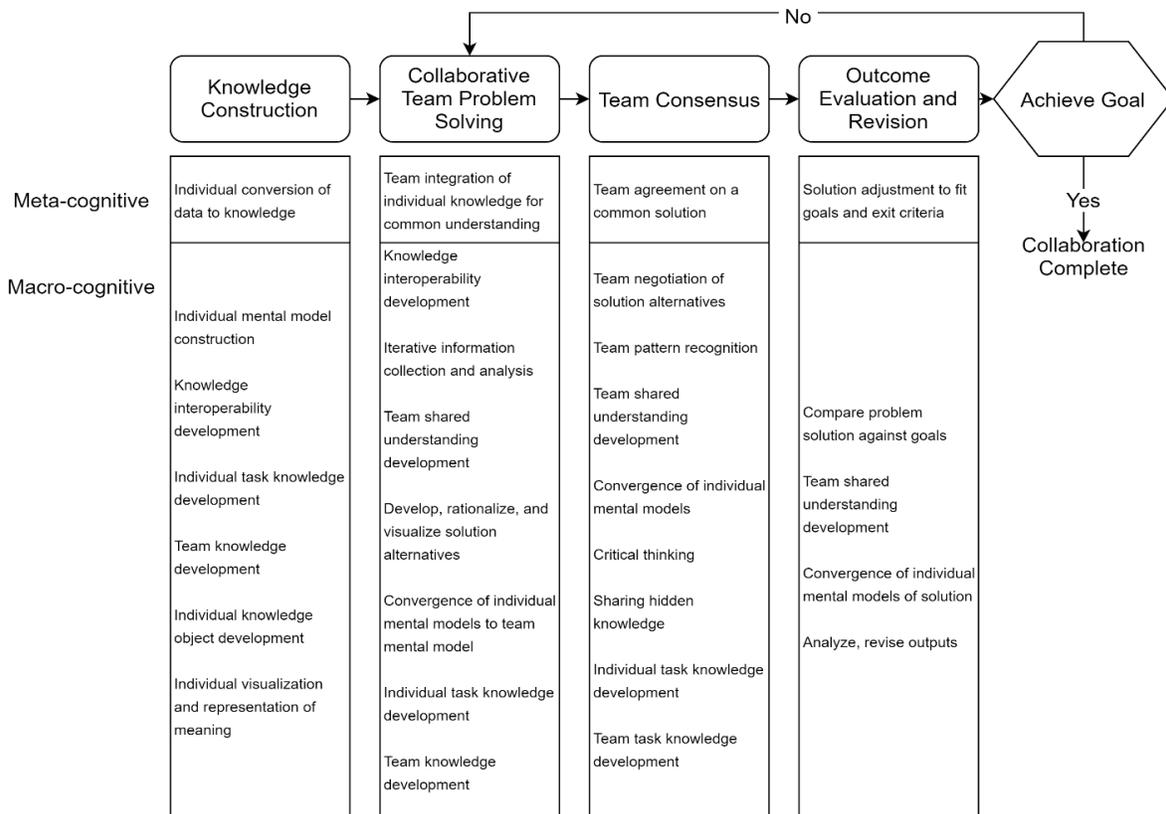
Figure 2. Group and individual cognitive processes during collaboration
(Warner, Letsky & Cowen, 2005)

This model can be mapped onto the cognitive model of the inquiry process (Zhang et al, 2010, see Figure 3), demonstrating that collaborative problem solving still follows the same process as individual problem solving. The primary difference is that in the beginning of the inquiry process, identification of the problem and searching possible solutions are distributed among group members who then combine their knowledge to collaboratively select and evaluate a solution.

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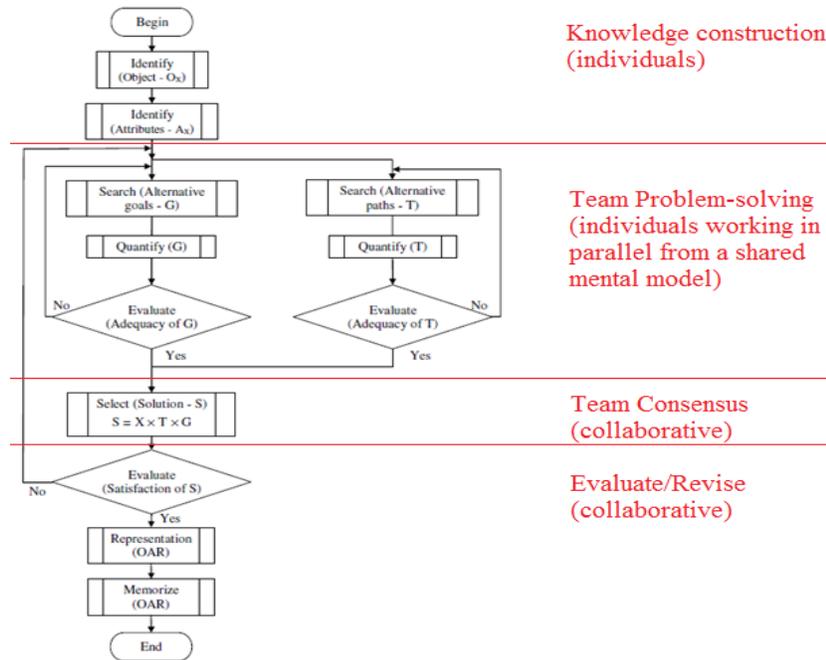
Figure 3. Mapping the team collaboration model onto the inquiry process model

Sutton (2013) states that when people collaborate, their alignment is simultaneously perceptual, cognitive, motivational, and affective. They try to see and understand each other's perspectives while encouraging each other and trying to be accepted as part of the group. As a result, collaboration may help people solve problems that are more complex than they could solve independently. The benefits of collaboration can be enhanced when the participants share experiences, such as culture or technology, or can be restricted when there is an uneven distribution of knowledge. Similarly, the epistemology of the individuals with respect to the context influences the effectiveness of the collaboration for problem solving (Hofer, 2001). Individuals have different perspectives on knowing that depend on the situation. For example, a person may view mathematics as absolute and games as complex. When an individual believes knowledge is absolute, collaboration puts that individual in a position of determining the "right" answer rather than seeing the different perspectives as equal possibilities, which is what more sophisticated epistemological development allows. Therefore, when considering how collaboration influences problem solving, the individual epistemologies within that context should also be considered.

Because experience helps the problem solving process, remembering key information from a problem solving experience would strengthen the skills one would need in a future endeavor. But does collaboration help individuals recall information? Suparna Rajaram (2011) suggests that collaboration both helps and harms recall. She reviewed several of her own studies as well as those conducted by others concerning memory effects when collaborating and found that working with others re-exposes the individual to knowledge he/she once had while correcting misconceptions he/she may have held about that knowledge. As a result, the knowledge is easier for the individual to recall and likely to be more accurate. However, working with others can also produce collaborative inhibition. Sharing information with others present increases the chances that another will interrupt one's thoughts, disrupting the retrieval of information, or may cause an individual to refrain from sharing because of a perceived taboo on the subject or a feeling of not being knowledgeable enough to speak in the group. Not only does this inhibition reduce the recall abilities of the group members as Rajaram found, it can cause an uneven distribution of

knowledge which Sutton (2013) claimed could restrict the problem solving capabilities of the group.

Warner, Letsky and Cowen (2005) found that a key mechanism of the collaborative problem solving model was communication. Sharing information and negotiating perspectives enhance the problem solving capabilities of the group. To test this mechanism, they collected data from two separate types of collaborations, teams that met in person and teams that collaborated asynchronously online. The teams that met in person had significantly more communication than the asynchronous teams did. The nature of the communication was also different between the two types of groups. The in-person groups spent more time in discussions during the knowledge construction stage while the asynchronous teams spent more time in the problem solving stage. Both types of groups found viable and satisfactory solutions to their problems. This suggests that the creation of a shared mental model is critical to solving a problem with others and requires the most communication; the in-person groups likely developed a shared model as they communicated their initial knowledge and understandings, while the asynchronous groups likely developed that shared model when they needed to explore possible solution paths.

In contrast, Blooma, Kurian, Chua, Goh and Lien (2013) observed interactions within an online forum designed for students to ask and receive help from each other. They hypothesized that these forums would enable micro-collaborations for problem solving to occur and thus analyzed the conversations for evidence of higher-ordered thinking as described in Bloom's taxonomy. Instead, they found that students mostly reached out to one another only to share factual or procedural knowledge. They also saw that most posts were students seeking to understand or explaining a concept rather than applying or synthesizing concepts. Even though these students were in the same class, and thus would be trying to solve similar problems, they did not establish a model of collaborative problem solving.

These studies suggest that there exists a particular mechanism that is especially useful for problem solving with others and that appears during conversations. According to two other studies, this mechanism is the process of explaining reasoning to another person. Robert Siegler (1995) studied forty-five preschoolers who were learning number conservation with an adult. Each child was given a series of problems that showed two parallel rows of objects with an equal number of objects in each row and, as one row was lengthened or shortened, were asked if the rows contained the same number of objects. One-third of the children received only brief feedback indicating if the answer was correct or not, one-third was asked to explain his/her reasoning before receiving feedback, and the remaining third received feedback then were asked to explain the adult's reasoning for the feedback. This experiment was conducted over four sessions with pre- and post-tests measuring growth. The group that was asked to explain the adult's reasoning answered correctly during the sessions 62% of the time overall, compared to 48% and 49% for the other groups, and their explanations increased in sophistication as the experiment progressed. Additionally, the post-test for this group showed about twice the growth of the other two groups, which showed approximately equal growth.

van Blankenstein, Dolmans, van der Vleuten and Schmidt (2011) worked with college students but found similar results. Undergraduates participated in a simulated group discussion after receiving information about an unfamiliar topic. One group was asked to only listen to the actors discussing the material, one group listened to actors discussing the material and asking each other, but not the participant, to elaborate his/her reasoning, and the third group conversed with the actors where the actors asked him/her to explain his/her reasoning or to elaborate. Post-tests were given immediately after the session and one month following. The participants who were asked to explain and elaborate were able to recall more information than the other two groups on both measures. The group that listened to others reason performed better than the listen-only group on the first post-test but both groups were at the same level one month later.

Providing explanations during collaboration appears to have the most impact for improving problem solving skills on lower-skilled participants when they work with higher skilled peers. Fawcett and Garton (2005) studied 100 children ages 6-7 performing sorting activities. After pretesting to determine individuals' sorting skills, children were partnered with a same-gender child in one of the following conditions: high pretest score with high, low with low, low with high, and no partner (control). In half of the partnered groups, one child was asked to explain what to do while the other did the sorting activity; in the other half, children were asked not to talk to each other and completed the sorting activities individually. Post-testing showed that the only one condition resulted in an average increase of more than one problem correct (out of nine problems), and that was when low-scoring children explained what to do to high-scoring partners. These children had an average gain of 2.1 problems correct.

Likewise, Taylor and McDonald (2007) worked with undergraduate students who had a history of struggling in mathematical problem solving. At first, these students worked in small groups with the assistance of a tutor on a series of non-routine problems in math. Students were given guidance on how to work together and on generic problem solving strategies but were not helped with the problems. The researchers found that students were not improving in their problem solving or math communication skills enough to handle the more complex problems they would be working on later. The researchers then modified these collaborative workshops so that the students were required to write a group report on the problem and their solution. The groups were provided with a heuristic for their report and were encouraged to complete each section of the heuristic as its corresponding problem solving step was completed, rather than do the entire report at the end. The tutors shifted their roles so that they were providing feedback on the writing rather than the problem solving. This shift changed the explanation-giving from like-skilled peer communication to lower-skill explaining to higher-skill as the tutor was asking for clarification from what the students wrote. As a result, the students gained both problem solving and communication skills and were able to solve the more difficult problems at the end of the study easier than they were able to solve the simpler problems at the beginning.

These studies show that providing explanations and being prompted for further detail or to consider another's viewpoint increases the individual's abilities to reason and to recall information, key skills when problem solving. Additionally, the skill levels of the person providing and receiving the explanation affect the level of impact that these explanation-giving activities will have on increasing problem solving skills. When the person providing the explanation is of lower skill compared to the person receiving the information, such as a child to an adult or a student to a tutor, then the lower-skill person increases his/her problem solving abilities more than if the reverse were true or if their skill levels were closely aligned.

4. Collaboration and problem solving in formal environments

Although the research shows that collaboration has benefits while problem solving, these benefits cannot be realized unless the people who should be collaborating see value in that process. Formal environments such as workplaces and classrooms may provide opportunities for, or even requirements for, collaboration, but the individual's perspectives and social skills may determine what benefits are actualized during such a collaboration.

The first aspect that might affect problem solving collaborations could be how the individual views risk. This view could affect what level of challenge the individual is willing to accept, which could then define his/her role in the collaboration. Meyer, Turner and Spencer (1997) studied the challenge-seeking behaviors of fourteen late-elementary students. Specifically, they measured each child's affect, achievement goals, academic risk-taking, self-efficacy, and volition then compared that to the child's behavior when working on a math project. This study found that the children who liked academic challenge and risk had a higher level of metacognition

than those who avoided challenge did, allowing them to use the difficulties they encountered in their projects as learning opportunities. They also defined success in terms of having a successful product rather than extrinsic factors such as grades or the positive opinions of others. The students who were challenge-avoiders, however, sought ways to simplify the project in order to avoid the difficulties encountered even when they knew they would receive a lower grade. It therefore would be easy to assume that one would want all challenge-seekers in a collaboration, but other research has found that individual characteristics may not affect the group significantly after all.

Lee, Huh and Reigeluth (2015) observed two high-school classes that engaged in project-based learning. Project-based learning was a regular occurrence in these classrooms, so the students were accustomed to collaboration while problem solving and inter-group conflict was a normal part of these collaborations. The researchers hypothesized that individual and group-level social skills could each impact the level of conflict or collaboration that the group experienced. What they found, however, is that the group's social skills had a higher level of impact than the individual had. An individual with poor social skills did not have a significant effect on the inter-group conflict if the group as a whole understood negotiation and other social skills required for collaboration. Therefore, as Figure 4 shows, an individual's characteristics may not significantly affect the group as long as the group has strong collaboration skills collectively.
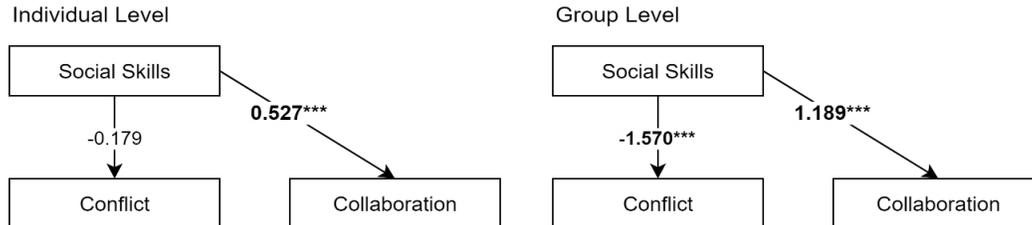
Figure 4. Impact of social skills on conflict and
collaboration at both the individual and group level
***$p < 0.001$ (Lee, Huh & Reigeluth, 2015)

In engineering, Kim and King (2004) observed intra-group conflict that happens when the product that the groups collaboratively developed shows a problem. Three groups of engineers worked on different aspects of a specialized chip, with each group being responsible for one aspect of the chip's design. When problems arose, each group suggested a possible cause for the problem in such a way that the responsibility to fix the problem would mostly fall on another group rather than their own. These suggestions were not offered as a means of avoiding challenge but because each group failed to see how the problem could be with their part of the design. To resolve such conflicts, the three teams adopted social norms that included sharing of expertise and listening to other's reasoning. The solution still placed the responsibility on one or two groups, but the solution was collaboratively agreed upon in each instance and the responsible group(s) were not the same for each problem. These findings reflect the model shown in Figure 5 in that the social skills between the groups both created conflict, when they saw issues as being another's responsibility, and enabled collaboration, when they shared expertise to arrive at a possible solution.

Another study demonstrates that employees value collaboration because they see it as necessary for successful problem solving. Itabashi-Campbell, Gluesing and Perelli (2012) interviewed thirty-one engineers in a variety of industries about the proximal processes involved in both their successes and failures. The engineers had five attributes common to their successes in problem solving: The external leadership provided clear goals and remained involved in the process, the engineers had the autonomy to change designs or seek help without political consequences, they had access to the people and materials they needed to solve the problem, all stakeholders maintained a sense of controlled urgency where they neither panicked nor relaxed too much, and there were systems in place for sharing information and processes. Their failure

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stories involved inertia, confusion, and disinterest by at least one stakeholder and the situation become one of placing blame rather than solving the problem. When the researchers evaluated the success and failure stories closer, they found that all of the successes also had five processes in common while the failures were each missing at least one of the processes. These processes were (1) communicating the problem to all involved parties, (2) investigating the problem, (3) determining the root cause of the problem and identifying a solution, (4) implementing the solution, and (5) distributing the learning to all stakeholders. Most notably was that all of the engineers verbalized the positive value they placed on collaboration through these proximal processes, with one engineer even reporting how he "forced" a collaboration to occur in order to obtain the different perspectives he needed to solve a problem with the product.

An additional proximal process that can have positive impact on one's career in academia at least is social connectedness. A study (Ozel, 2012) examined the publications of Turkish management researchers from 1922 through 2008 for who the researchers collaborated with, what topics they wrote about, and, where possible, how many professional groups each researcher belonged to. Researchers who published internationally tended to collaborate with other researchers in the same field, demonstrating a deep social connectedness within that field of study. Researchers who published nationally, however, showed greater diversity in who they collaborated with, demonstrating a broader, but perhaps shallower, social connectedness than the internationally-published researchers. Similarly, those with deeper social connectedness within one field of study and/or with involvement in several professional groups tended to publish mostly about mainstream issues. The study also suggested that these highly-connected researchers could be determining what those mainstream issues are when they publish because they also appear to be publishing at the beginning of the issue as well as later.

Collaboration in formal settings has many benefits, from career advancement to solving product issues. They can only be successful, however, when the group has agreed-upon social norms and structures for collaborating. When these structures are in place, the effect of an individual's skills are minimized so that negative skills will not prevent the group from finding a solution. Other proximal processes in the workplace can provide additional supports for problem solving and career advancement. These include being able to communicate with people outside of the group and networking with others in the field but outside of the geographical area.

5. Problem solving and collaboration in game spaces

Game spaces provide unique opportunities for proximal processes and problem solving because they have low stakes for failure, allowing greater risk-taking behavior, and challenges that elicit both competition and collaboration (Gee, 2007). These opportunities can exist in both video games and in-person games such as board games. The characteristics of these collaborations are similar to those found in formal environments, but the characteristics of who is participating in the collaboration has less to do with perspectives towards challenge and more to do with self-efficacy within the environment. Additionally, the genre of the game can be seen as a proximal process in that different genres have different effects on the player's personal identity and stress level.

The primary communication found within a game space is the sharing of information or ideas, but this tends to precede critical thinking discussions. Marc Cicchino (2015) developed a social studies board game for eighth graders that emulated the French and Indian War in colonial America. Students formed teams that represented each of the nations involved in the conflict, with each team provided with different start and end conditions for the game. The game encouraged alliances between the "nations," so the children engaged in both inter- and intra-group discussions. Cicchino found that most of what the students said were to share or clarify an idea, but most of these statements then lead to a discussion among the children that involved

critically thinking about the problem they were trying to solve within the game. Negotiation and co-constructing knowledge were the next most common statements, demonstrating that even in a game environment the children were following the model of team collaboration (Warner, Letsky & Cowen, 2005) described earlier.

Another study (Shih, Shih, Shih, Su & Chuang, 2010) demonstrated that within a game having a low-skill player explaining to another player has more benefits for learning problem solving skills than having a high-skill player explain. They had two eleven-year old girls play a video game for problem solving individually for an hour then partnered each with a boy of the same age. During the individual sessions, one girl demonstrated lower problem solving skills than the other; she randomly tried approaches to the puzzles rather than systematically finding solutions and she did not apply learning from previous puzzles to new scenarios like the other girl did. When partnered, however, she was able to complete more puzzles than the more systematic player and her partner were able to complete. The conversations between partners helps demonstrate why. When both girls were going through the areas of the games they experienced before, they controlled the computer and the boys each observed. However, the girl who had difficulty on her own explained to her partner what was happening in the game while the other girl did not communicate with her partner at that time. When each pair encountered puzzles that the girls had not previously seen, the first girl worked with her partner to collaboratively find solutions. By the end of the game, she was demonstrating a more systematic approach to the puzzles, which she learned from her partner. The other girl, however, maintained control of the game even with the new puzzles. When her partner had an idea, he tried to take control of the computer rather than share his idea with her, resulting in arguments rather than collaboration. This study might demonstrate one reason why lower-skilled people explaining to higher-skilled people has greater benefits for learning problem solving than other configurations; higher-skilled people may be reluctant to share their learning with others.

Social ties and perceived expertise also influence collaboration in game spaces. Bluemink, Hamalainen, Manninen and Jarvela (2010) observed the interactions between college students playing a puzzle-based role-playing video game. Some of the students had prior social ties with others in their group or had prior experience playing video games in this genre while others did not. Similar to the history board game study, this study found that most of the conversations concerned information and idea sharing and that these led to critical thinking discussions. However, the discourse in each group was dominated by the person(s) who had prior social ties or gaming experience while the person who knew nobody in the group and who did not play games talked the least. Additionally, the nature of the conversations was different depending on who was in the group. Groups who has experienced gamers in them also had more conversation statements that involved giving instructions or orders than the other groups had, while the other groups had more information-sharing statements and conversations around ideas. This study also suggests a reason why having a high-skilled person explaining is less beneficial; that person might demonstrate their knowledge through instructions rather than explanations.

Hou (2013) also demonstrated that self-efficacy within a game environment effects the number of interactions that the player will have. Fourth graders in Taiwan played a massively-multiplayer game designed to strengthen English language acquisition. All participants, regardless of gender or ability, engaged in approximately the same number of learning activities, but those with higher English skills also participated in more interactions with other players and with non-player characters than those with lower skills did. These interactions often led to other interactions within the game, resulting in the students with higher skill levels receiving more conversational practice than the other students received.

A significant benefit that game spaces have over other environments for learning and problem solving is the competition between players inherit to most games. Cagiltay, Ozcelik and Ozcelik (2015) modeled the effect that a learning game for computer science had on college

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students' understanding of databases. As Figure 5 demonstrates, they found that competition between players had a positive effect on motivation, which increased player's accuracy and resulted in significant gains on the post-test. Competition and motivation did not have a significant effect on the students' response times. This suggests that the proximal processes could be competitive rather than collaborative in nature and still be beneficial for problem solving within a game.
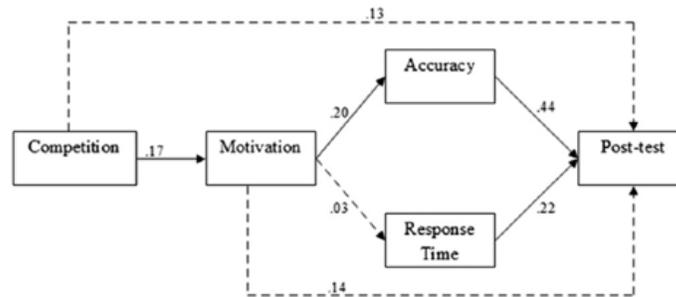

Figure 5. Standardized path coefficients showing the effect of competition (Cagiltay, Ozcelik & Ozcelik, 2015).

Playing video games recreationally may also be related to understanding science. Fraser, Shane-Simpson and Asbell-Clarke (2014) surveyed 1502 teens on their gaming habits, science self-efficacy, and science scores. 94% of those surveyed had played a video game at least once in the previous week. Students who preferred first-person shooter games, race games, or problem solving games had stronger self-efficacy and scores in science than those who played other types of games. Although most of these teens did not play with others, online or in person, they did discuss games regularly with peers and with online affinity groups. Additionally, all three of the preferred game genres involve interactions with non-player characters in either a competitive or collaborative setting.

Collaborating in game spaces is similar to collaborating in formal environments in that the team collaborations follow the same problem solving processes in both areas and that they especially benefit lower-skilled participants when they explain ideas to higher-skilled participants. Game spaces have an additional proximal process, however, which is competition. Competition increases motivation, which in turn increases one's problem solving skills and learning. Using game spaces for problem solving can be problematic, however, when one participant has lower self-efficacy in that environment. The group will still be able to solve the problem, but the self-efficacy of each participant will influence how much he/she participates.

6. Discussion

Problem solving follows a cycle of inquiry where the individual iterates between finding possible paths and exploring their likely effectiveness before selecting one as a possible solution. This cycle can be greatly enhanced through collaboration because the number of paths that can be explored in depth are greater when more people work on the same problem. This enhancement emulates the problem solving process of expert chess players when they are familiar with the board state in that paths can be explored in greater depth without requiring that each individual be an expert in the problem scenario.

The key benefit collaboration has for problem solving is in the providing of explanations, as long as the person communicating has less skill than the person listening. This is likely due to the listener asking for clarification or deeper reasoning in order to understand the speaker correctly, as was shown in the simulated conversations studied by van Blankenstein, Dolmans, van der Vleuten and Schmidt (2011). When a higher skilled person has to explain to a

peer or a lower skilled person, they tend to give instructions rather than reasons, at least in game environments. However, a lower skilled person may feel reluctant to participate in conversation, thus reducing their opportunities to learn. Having structures in place for collaborating would help alleviate both higher-skilled dominance and lower-skilled hesitance. Collaboration structures also support successful problem solving by minimizing the effect that any individual has on the group.

Although the benefits of proximal processes for problem solving are well explained in the literature included in this paper, the limited number of studied is of some concern. The focus on collaboration shown in these studies limits the discussion to only those proximal processes that occur within a defined group. Lacking in the literature is the understanding of how proximal processes can evolve or support problem solving outside of a group collaboration. Additionally, it might be worth understanding who is likely to seek others when problem solving, under what conditions, and who those "others" would be. For example, if lower-skilled people benefit most by explaining their reasoning to others, are they also the people most likely to seek others to work with? Or will low self-efficacy prevent them from discussing the problem with others? Further understanding of the proximal processes for problem solving could benefit student-retention research in high problem solving majors such as engineering, corporate responses to product failures, and the development of problem solving skills in children.

Acknowledgements

References

Bilalic, M., McLead, P., & Gobet, F. (2009). Specialization effect and its influence on memory and problem solving in expert chess players. *Cognitive Science, 33*, 1117-1143.

Blooma, M., Kurian, J., Chua, A., Goh, D., & Lien, N. (2013). Social question answering: Analyzing knowledge, cognitive processes, and social dimensions of micro-collaborations. *Computers and Education*, *69*, 109-120.

Bluemink, J., Hamalainen, R., Manninen, T., & Jarvela, S. (2010). Group-level analysis on multiplayer game collaboration: How do the individuals shape the group interaction? *Interactive Learning Environments*, *18*(4), 365-383.

Cagiltay, N., Ozcelik, E., & Ozcelik, N. (2015). The effect of competition on learning in games. *Computers and Education*, *87*, 35-41.

Cicchino, M. (2015). Using game-based learning to foster critical thinking in student discourse. *Interdisciplinary Journal of Problem Based Learning*, *9*(2).

Fawcett, L. & Garton, A. (2005). The effect of peer collaboration on children's problem-solving ability. *British Journal of Educational Psychology*, *75*, 157-169.

Fraser, J., Shane-Simpson, C., & Asbell-Clarke, J. (2014). Youth science identity, science learning, and gaming experiences. *Computers in Human Behavior*, *41*, 523-532.

Gee, J. P. (2007). *What video games have to teach us about learning and literacy*. NY: Palgrave MacMillan.

Gee, J. P. (2013). *The anti-education era: Creating smarter students through digital learning*. NY: Palgrave MacMillan.

_____

Goldman, A. (1983). Epistemology and the theory of problem solving. *Synthese*, *55*(1), 21-48.

Hofer, B. (2001). Personal epistemology research: Implications for learning and teaching. *Journal of Educational Psychology Review*, *13*(4).

Hou, H. (2013). Analyzing the behavioral differences between students of different genders, prior knowledge and learning performance with an educational MMORPG: A longitudinal case study in an elementary school. *British Journal of Educational Technology, 44*(3).

Itabashi-Campbell, R., Gluesing, J., & Perelli, S. (2012). Mindfulness and product failure management: An engineering epistemology. *International Journal of Quality & Reliability Management*, *29*(6), 642-665.

Kim, J., & King, J. (2004). Managing knowledge work: Specialization and collaboration of engineering problem-solving. *Journal of Knowledge Management*, *8*(2), 53-63.

Lee, D., Huh, Y., & Reigeluth, C. (2015). Collaboration, intragroup conflict, and social skills in project based learning. *Instructional Science*, *43*, 561-590.

Meyer, D., Turner, J., & Spencer, C. (1997). Challenge in a mathematics classroom: Students' motivations and strategies in project-based learning. *The Elementary School Journal*, *97*(5).

National Governors Association Center for Best Practices, & Council of Chief State School Officers (2010). *Common Core State Standards*. Washington D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.

Ozel, B. (2012). Individual cognitive structures and collaboration patterns in academia. *Scientometrics*, *91*, 539-555.

Partnership for 21st Century Learning (2015). *P21 Framework Definitions*. Retrieved from http://www.p21.org/about-us/p21-framework.

Rajaram, S. (2011). Collaboration both hurts and helps memory: A cognitive perspective. *Current Directions in Psychological Science*, *20*(2).

Shih, J., Shih, B., Shih, C., Su, H., & Chuang, C. (2010). The influence of collaboration styles to children's cognitive performance in digital problem-solving game "William Adventure": A comparative case study. *Computers and Education*, *55*, 982-993.

Siegler, R. (1995). How does change occur: A microgenetic study of number conservation. *Cognitive Psychology, 28*, 225-273.

Sutton, J. (2013). Skill and collaboration in the evolution of human cognition. *Biological Theory*, *8*, 28-36.

Taylor, J. A., & McDonald, C. (2007). Writing in groups as a tool for non-routine problem solving in first year university mathematics. *International Journal of Mathematical Education in Science and Technology, 38*(5), 639-655. https://doi.org/10.1080/00207390701359396

van Blankenstein, F., Dolmans, D., van der Vleuten, C., & Schmidt, H. (2011). Which cognitive processes support learning during small group discussion? The role of providing explanations and listening to others. *Instructional Science*, *39*(2), 189-204.

Warner, N., Letsky, M., & Cowen, M. (2005). Cognitive model of team collaboration: Macro-cognitive focus. *Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting*.

Zhong, N., Wang, Y., & Chiew, V. (2010). On the cognitive process of human problem solving. *Cognitive Systems Research*, *11*, 81-92.

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Investigation of Gifted Students' Science Laboratory Academic Risk Taking Tendencies and Science Learning Orientations in Terms of Some Variables

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Abstract

In this research, it was aimed to investigate academic risk taking tendencies on laboratory activities and science learning orientations of gifted students. In the research (survey) quantitative research method designs was used. The sample of the research consisted of 187 gifted students who are studying in a Science and Art Center in the Eastern Anatolia Region. In the research, Science Laboratory Academic Risk Taking Scale and Learning Engagement in Science Scale were used as data collection tools. The findings indicated that the academic risk taking tendencies on laboratory activities and science learning tendencies of the gifted students were high. In addition, it was found that there was a moderate and significant relationship between the academic risk taking tendencies and their science learning orientations of gifted students.

Keywords: gifted students, laboratory activities, academic risk taking, science learning orientation, science and art center.

1. Introduction

In today's world, there are rapid changes in science and industry. These changes have brought some innovations in the field of education and the roles of students and teachers in educational environments have also changed (Almeida & Simoes, 2019). In the new education systems individuals are expected to produce solutions to current problems, develop critical thinking skills, and make courageous decisions in difficult cases and exhibit behaviors such as adapting to technological developments (Kinshuk, 2016). Changes in students' needs and desires brought up the updates in education systems and in this context, the science curriculum was inevitably updated at different times.

In Turkish science curriculum, it is emphasized that students should have the skills to insist on learning, to take risks in appropriate conditions by planning and to produce evidence-based results (Ministry of National Education [MoNE], 2018). Undoubtedly, it is possible for students to acquire these competencies by creating suitable learning environments (Hassi, 2016). Laboratory activities, one of these learning environments, including processes such as trial-error

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and repetition play an important role in the science teaching process (Kwok, 2015; Yazıcı & Kurt, 2018).

- Gifted students have high academic risk taking tendency and high science learning orientations.
- There is no significant difference between academic risk taking tendencies and science learning orientations of male and female gifted students.
- Academic risk taking tendencies and science learning orientations of gifted students do not differ according to the program they are studying at science and art center.
- There is a moderate and significant relationship between academic risk taking tendencies and science learning orientations of gifted students.

Laboratory activities that make learning meaningful and permanent (Yavuz & Akçay, 2017) increase the interest to the science course (Freedman, 1997). Students who actively take part in laboratory activities: make sense of what they learned by gaining reasoning and critical thinking skills (Atasoy, 2004), get opportunity to embody abstract knowledge, exhibit a positive attitude towards science (Freedman, 1997), and develop sophisticated epistemological beliefs on tentativeness of scientific knowledge (Kılıç & Soran, 2011). Laboratory activities also play an important role in filling the gap between theoretical and practical applications in science teaching (Cullin, Hailu, Kupilik & Petersen, 2017). Therefore, it cannot be expected that the science course which does not include laboratory activities will meet the mentioned general and specific aims. Also, in order to meet these aims, students need to be supported for affective qualifications as well as cognitive development in learning processes (Freedman, 1997). One of these affective characteristics is the academic risk taking tendency (ARTT) that emphasizes the courage and desire of students in their learning processes (Robinson & Bell, 2012).

Risk taking is expressed as a desire to act against an uncertain situation (Young, 1991). Academic risk taking is expressed in different ways in the literature and it is generally defined as the willingness and courage of students to cope with the problems they face in their learning environments (Bozpolat & Koç, 2017; Varışoğlu & Çelikpazu, 2019; Yaman & Köksal, 2014). Academic risk taking skills allow students to think critically and deeply on problems that do not have a definite answer and to develop their experiences (Hills, Stroup & Wilensky, 2005; Weiner, 1994). Therefore, students with high academic risk-taking skills want to learn something new, even if there is a possibility of making mistakes, they seek alternative solutions to the problems they face (Beghetto, 2009) and they show resistance to the problems (Clifford, 1991; Gupta & Pasrija, 2016).

ARTT, which is one of the important variables that affect students' behaviors in the classroom environment (Çetin, İlhan & Yılmaz, 2014), can be examined under the direction of negative emotions as a result of failure, tendency to prefer difficult processes and re-recovery behaviors (Tay, Özkan & Akyürek-Tay, 2009). Although the importance of academic risk taking skills is emphasized in the science learning process (Çakır & Yaman, 2015; Gupta & Pasrija, 2016), it is stated that the academic risk taking levels of students cannot be at the desired level in today's learning environments (Henriksen & Mishra, 2013). In this context, Bozpolat and Koç (2017) emphasized that learning environments in which students can express their views freely without fear are important for cognitive development. For this reason, it is important that the teachers should know the level of academic risk taking skills of their students to be able to make the right orientation in appropriate learning environments (Avcı & Özenir, 2016; Eugene, 2010). In the light of these evaluations, the focus of the study is on gifted students who are able to move their knowledge to changing situations, and are willing to choose difficult tasks (Coleman, Micko & Cross, 2015) and are superior to their peers in terms of at least one qualification.

Gifted students have important roles in the development of societies (Karakaya, Ünal, Çimen & Yılmaz, 2018). In the future, the education of these students (Akbaş & Çetin, 2018), who has a high potential to participate in the decision-making mechanisms of countries, should be given special importance. At the same time, the cognitive and affective dimensions should be taken into consideration in the education of these students who are shown to be the closest candidate to be the future scientist and who like to solve the problems they face by questioning (Schreglmann, 2016). It is also necessary to take the steps to increase the academic risk taking levels of these students for laboratory applications, which have a very important place in the science course. Because, considering the general and specific aims of science teaching, it is stated that science laboratory will help students in taking academic risk (Deveci, 2018). In this content, it is thought that one of the variables that affect students to take academic risk in science laboratory is science learning orientation (SLO).

Learning orientations are one of the most important variables that ensure the achievement and continuity of students' academic achievement (Sevil & Erdoğan, 2018). Orientation to learning is a component of motivation, which is expressed as internal or external power that drives individuals to events (Yetişir & Ceylan, 2015). The learning orientations which express the actions taken to make the learning process meaningful and valuable (Wood & Bandura, 1989), enables students to learn from the mistakes they make and helps them cope with the problems they face. Achievement goal orientation which expresses the reasons why individuals want to learn and their beliefs in determining their goals in order to be successful (Ames, 1992), is examined in two parts as learning and performance goals (Ames & Archer, 1988). In the goal orientation theory, the reasons and motivation levels of the students' performance in learning environments are taken into consideration (Ames, 1992) and it is thought that the students' academic learning orientations should be emphasized in this direction (Yerdelen, Aydın, Gürbüzoğlu-Yalmancı & Göksu, 2014). In this context, in today's education system, it is aimed to increase the learning orientation levels and to provide appropriate learning orientations along with the intrinsic motivation of the students (Hırst, Knıppenberg & Zhan, 2009).

When the literature is examined, it is seen that there are studies examining students' academic risk taking tendencies towards science (Beghetto, 2009; Çakır & Yaman, 2015; Çınar, 2007; Daşçı & Yaman, 2014). For example, Beghetto (2009), in his study conducted with primary school students, stated that academic risk taking behaviors of students decreased as the grade level decreased. Çakır and Yaman (2015) stated that there is a positive moderate relationship between academic risk taking skills and academic achievement of secondary school students. However, there is no study examining academic risk taking tendencies and science learning orientations of gifted students in science laboratory activities. In this respect, the study is thought to contribute to the literature. Because teaching activities carried out in order to increase academic risk taking skills and science learning orientations of gifted students in science laboratory activities are thought to help them to be willing to conduct scientific and academic studies by selecting professions appropriate to their interests and abilities, to be courageous and willing to solve the problems they face in their lives and to show leading behaviors for the scientific and technological advancement of the society. In order to take the necessary steps in this regard, it is important to examine the academic risk taking tendencies and learning orientations of gifted students in science laboratory activities.

In the literature, gender is thought as one of the variables that have an impact on students' academic risk taking tendencies and science learning orientations. It is seen that different results are reported in the literature about whether students' academic risk taking tendencies and science learning orientations differ according to gender. For example, while Clifford et al. (1990) reporting that female students' academic risk scores were lower than male students, Abdullah and Osman (2010) stated female students tend to take more risks than boys. In contrast to these studies, Strum (1971) examined the academic risk taking tendencies of

secondary school students and concluded that there was no significant relationship between academic risk taking and gender. This result is similar to that of Miller and Byrnes (1997) and Avcı and Özenir (2016). Therefore, inconsistencies between the results of these studies require that students' academic risk taking tendencies and science learning orientations should be examined in terms of gender variable.

Along with the gender, another important variable that can be effective on students' academic risk taking tendencies and science learning orientations is program within SAC. No study comparing academic risk taking tendencies and science learning orientations of students enrolled in different SAC programs was reached in the literature. However, it can be accepted that there is a hierarchy between SAC programs and classroom level. That is, age and class level of students increase as students go from support education to project production and management program. Therefore, the results of the studies investigating the changes in academic risk taking and science learning orientation according to grade level were examined. In this context, Açıkgül and Şahin (2019), who examined the academic risk taking tendencies of secondary school students in terms of different variables, found that the 6th grade students "academic risk taking scores were significantly higher than the 7th and 8th grade students" scores. Similarly, Atkins, Leder, O'Halloran, Pollard and Taylor (1991), who conducted studies with high school students, concluded that students' academic risk taking tendencies decreased in contrast to the grade level. Beghetto (2009), on the other hand, stated that the higher the grade level, the lower the students' academic risk taking levels. Daşçı and Yaman (2014) concluded that academic risk taking behaviors of 4th and 8th grade students did not show significant differences. Therefore, the different results obtained in the researches require that academic risk taking and science learning orientations should be examined according to gender and program variables. In the current research, the study was conducted with gifted students studying in different programs at a SAC. SACs are an institution providing education to students who are diagnosed with special abilities in Turkey. In this educational institution, courses are offered under Support Education (SE), Recognizing Individual Capabilities (RIC), Developing Special Skill (DSS) and Project Production and Management (PPM) programs. Gifted students who succeed in certain exams are trained in these programs. In the present study, it was thought that examining academic risk taking tendencies and science learning orientations of gifted students according to gender and program variables would contribute to the literature.

In the light of all these evaluations, in this study, it is aimed to investigate the academic risk taking tendencies in laboratory activities and science learning orientations of gifted students and the relationship between these two variables. In this context, the answers to the following problems were sought:

(1) What is the level of gifted students' to take academic risk taking tendency in laboratory activities?

(2) Do the gifted students' academic risk taking tendency in laboratory activities differ by gender?

(3) Do the gifted students' academic risk taking tendency in laboratory activities differ by the program they are studying?

(4) What is the level of science learning orientation of gifted students?

(5) Do the science learning orientations of gifted students differ by gender?

(6) Do the science learning orientations of gifted students differ by the program they are studying?

(7) Is there a significant relationship between the academic risk taking tendency and the learning orientation of science students in laboratory activities of gifted students?

2. Method

2.1 *Research design*

In this research, a survey design, one of the quantitative research design, was used. The survey design includes the process of collecting, organizing and describing data from the whole or a significant part of the accessible population in order to reach a generalizable judgment (King & He, 2005). In the present study, the survey design was preferred since it was aimed to investigate the academic risk taking tendencies and science learning orientations of gifted students in science laboratory studies.

2.2 *Population and sample*

The sample of the study consisted of 187 gifted students in a SAC in Turkey. The sample of the study was selected from the accessible population using the appropriate sampling method and demographic information for the participants is presented in Table 1:

Table 1. Demographic information for participants

Variables	Personal characteristics	f	%
Gender	Girl	97	51.9
	Boy	90	48.1
Age	8-11	77	41.2
	12-15	88	47.1
	16-18	22	11.8
Studied SAC Program	Support Education (SE)	49	26.9
	Recognizing Individual Capabilities (RIC)	55	29.4
	Developing Special Skills (DSS)	53	28.3
	Project Production and Management (PPM)	30	16.0

When Table 1 is examined, 97 (51.9%) of the participants are girls and 90 (48.1%) are boys. Among participants, 49 of them are in SE, 55 of them are in RIC, 53 of them are in DSS and 30 of them are studying in PPM program.

2.3 *Data collection tools*

The science laboratory Academic Risk Taking Scale (ARTS) was used to examine the participants' tendency to take academic risk for science laboratory studies. The necessary permissions were obtained before the scale developed by Deveci (2018) was used. The scale consists of 12 items and consists of Cautious Risk Taking, Academic Risk Taking and Unconditional Risk Taking dimensions. Sample items for each dimension are given in Table 2:

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Table 2. Dimensions and sample items of ARTS

Scale	Dimensions	Items	Sample Item
Science Laboratory Academic Risk Taking Scale	Cautious Risk Taking	1, 2, 3, 4, 5	I enjoy watching my friends doing dangerous experiments.
	Academic Risk Taking	6, 7, 8, 9	I do not avoid to try different solutions while doing experiments.
	Unconditional Risk Taking	10, 11, 12	I prefer to do experiments alone in the lab taking risks.

In order to ensure the content validity of the scale, opinions of two education experts and one Turkish teacher were taken. In this context, the educational experts examined the appropriateness of the items of the scale for the gifted students, and the Turkish teacher examined the scale in terms of intelligibility, spelling and spelling rules. As a result of the evaluations, considering the intensive science laboratory studies carried out in SACs, the education experts stated that the scale could be used to examine the academic risk taking tendencies of these students for laboratory studies. Cronbach's Alpha value was calculated to ensure the reliability of the data collection tool. In this context, while Deveci (2018) calculated the reliability coefficient of the scale as .79, it was calculated as .83 in the present study. In addition, Science Learning Orientation Scale (SLOS), which was adapted by Yetişir and Ceylan (2015), was used as data collection tool. The scale consists of 32 items and four dimensions. These dimensions are: Orientation to Learning Objectives, Self-regulation, Valuing, Self-efficacy. Sample items for each dimension are given in Table 3:

Table 3. Dimensions and sample items of SLOS

Scale	Dimensions	Items	Sample Item
Science Learning Orientation Scale	Orientation to Learning Objectives	1, 2, 3, 4, 5, 6, 7, 8	It's important to understand what I'm working on.
	Valuing	9, 10, 11, 12, 13, 14, 15, 16	What I have learned has practical value.
	Self-efficacy	17, 18, 19, 20, 21, 22, 23, 24	No matter how hard the studies are, I can learn.
	Self-regulation	25, 26, 27, 28, 29, 30, 31, 32	Even if there's better things to do, I keep working.

Cronbach's Alpha value was calculated to ensure the reliability of the SLOS. As a result of this study, the reliability coefficient of the scale was calculated as .84.

2.4 *Data analysis*

In the study, the lowest score that students can get from the ARTS is 12 and the highest score is 60. On the other hand, the lowest score that can be obtained from SLOS is 32 and the highest score is 160. In order to determine the students' academic risk taking tendencies and learning orientation levels, the cut-off points were determined by subtracting the lowest score from the highest score that can be obtained from the scale in order to make the response options continuous. In this context, the cut-off values for both scales and the corresponding levels are given in Table 4.

Table 4. Cut-off points for the scales

Level	Cut-off Points	
	Academic Risk Taking Scale	Science Learning Orientation Scale
Very Low	12.0-21.6	32.0-57.6
Low	21.6-31.2	57.6-83.2
Moderate	31.2-40.8	83.2-108.8
High	40.8-50.4	108.8-134.4
Very High	50.4-60.0	134.4-160.0

In order to determine whether the students' academic risk taking tendencies and science learning orientation scores differed by gender t-test was used, and ANOVA was used to determine whether they differed by the program. In order to perform ANOVA and t-test analyzes, firstly, the descriptive statistical analysis was done to check whether the data showed normal distribution within the groups. Finally, correlation analysis was conducted in order to determine whether there is a significant relationship between students' academic risk taking tendencies and science learning orientations. In this context, Pearson Product Moment Correlation Coefficient analysis, which is used to determine whether there is correlation between normal distributed variables and direction of determined correlation, is used.

3. Results

In this study, firstly, the findings obtained from descriptive statistical analysis are presented. In this context, it was checked by normality test whether the students' academic risk taking and science learning orientation scores were distributed normally. In normality tests, Kolmogorov-Smirnov test is suggested if the sample consists of 35 or more participants (McKillup, 2012). Since there are 187 participants in the study, Kolmogorov-Smirnov normality test was performed and the results are given in Table 5.

Table 5. Normality test results

Scales	Variables		Kolmogorov-Smirnov		
			Statistics	df	Sig.
Academic Risk Taking	Gender	Boy	.078	90	.200
		Girl	.059	97	.200
	Program	SE	.089	49	.200
		RIC	.080	55	.200
		DSS	.117	53	.067
		PPM	.094	30	.200
Science Learning Orientation	Gender	Boy	.068	90	.200
		Girl	.078	97	.174
	Program	SE	.134	49	.028
		RIC	.070	55	.200
		DSS	.060	53	.200
		PPM	.114	30	.200

As can be seen in Table 5, students' academic risk taking tendencies and science learning orientation scores show a normal distribution by gender (p> .05). Therefore, t-test can be used when comparing students' scores according to gender. On the other hand, it was seen that the normality assumption in the SE group was not met (p <.05), but not for the other programs (p> .05). After the scores of the students registered in the SE program were found to be significant, the mean, mode and median values and kurtosis and skewness values of these students' scores were examined. The mean (44.92), mode (45.00) and median (45.00) values of students were very close to each other. In addition, the kurtosis (.524) and skewness (.328) values of the scores do

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not exceed the range of +1/-1. Therefore, it was assumed that the scores were normally distributed within this group (Fraenkel & Wallen, 2006; George & Mallery; 2001). Based on these results, it was decided that ANOVA could be used to determine whether the scores differ according to the group variable.

From the findings of normality assumption, the findings about the level of students' academic risk taking tendencies and science learning orientations were examined. The mean scores of the students were evaluated according to the criteria defined in Table 4. The results obtained are given in Table 6.

Table 6. Average values of students from the scales

Scale	Mean
Academic Risk Taking Tendency	45.21
Science Learning Orientation	123.94

In Table 4, it is stated that the average of the scores from the scales is accepted as "High" if it is in the range of 40.8-50.4 for the academic risk taking tendency scale and in the 108.8-134.4 range for the science learning orientation scale. In this context, when the values in Table 6 are compared with the determined limit values, it can be said that students' academic risk taking tendencies and science learning orientations are "high".

After determining the levels of the students, the analysis was conducted to determine whether the scores obtained from the scales differ by gender. The t-test was used to compare scores according to gender. The obtained results are given in Table 7.

Table 7. Comparison results of ARTT and science learning orientation scores by gender

		Levene Test on Equality of Variances		t-test		
		F	p.	t	SD	p.
Academik Risk Taking Tendency	Equal Variances Assumed	.475	.491	-.036	185	.971
	Equal Variances Not Assumed			-.036	179.92	.971
Science Learning Orientation	Equal Variances Assumed	.228	.633	.874	185	.383
	Equal Variances Not Assumed			.873	183.34	.384

When Table 7 is examined, it is seen that the assumption of equality of variances is not violated for both scales (p> .05). Therefore, the significance values in the case where the variances are equal are considered in the table. Since the t-test results for both scales are not significant, it can be said that there is no significant difference between the ARTT (p>.05, t=-.036) and science learning orientations (p>.05, t=.874) of gifted female and male students. In other words, the tendency of gifted students to take academic risk and science learning orientation does not change according to gender.

After determining whether the scores obtained from the scales did not differ according to gender, it was examined whether the scores of the students differed by the program they were studying. Since there are four different program types in SAC, ANOVA was used to compare the scores. As a result of the analysis, information on the assumption of equality of variances is given in Table 8 and ANOVA results are given in Table 9.

Table 8. Levene test results for ARTT and SLO scores

	Levene Statistics	**SD1**	**SD2**	**p.**
Academic Risk Taking Tendency	.896	3	183	.444
Science Learning Orientation	.994	3	183	.397

As can be seen in Table 8, the assumption of equality of variances in both scales was not violated (p> .05). After checking this assumption, ANOVA was carried out and the results are given in Table 9.

Table 9. ANOVA results for ARTT and SLO scores

		Sum of Squares	**SD**	**Mean Square**	**F**	**p.**
Academic Risk Taking Tendency	Between Groups	64.008	3	21.336	.839	.474
	Within Group	4655.435	183	25.440		
	Total	4719.444	186			
Science Learning Orientation	Between Groups	656.282	3	218.761	1.186	.317
	Within Group	33762.071	183	184.492		
	Total	34418.353	186			

When Table 9 is examined, it can be said that academic risk taking tendencies and science learning orientations of gifted students do not differ according to the program variable (for Academic Risk Taking Tendency [$F_{(3-183)}$ =.839; p=.474> .05], for Science Learning Orientation [$F_{(3-183)}$ =1.186; p=.317> .05].

After comparing student scores according to the program studied at SAC, it was examined whether there was a significant relationship between academic risk taking tendencies and science learning orientations of gifted students. In order to determine the relationship between variables, Pearson Product-Moment Correlation Coefficient analysis was performed and the results are given in Table 10.

Table 10. The results of the relationship between ARTT and SLO

		Academic Risk Taking Tendency	Science Learning Orientation
Academic Risk Taking Tendency	Pearson Correlations	1	.430[**]
	p.		.000
	N	187	187
Science Learning Orientation	Pearson Correlations	.430[**]	1
	p.	.000	
	N	187	187

[**] Correlation is significant at 0.01 (2-Way) level.

If the correlation coefficient between the two variables is between .10 and .29, it refers to low correlation, if correlation coefficient is between .30 an.49, it means the correlation is moderate and if the coefficient is between .50 and 1.00, then the two variables are highly correlated (Cohen, 1988). Therefore, as it can be seen in Table 10, it can be said that there is a moderate and significant correlation in a positive way between the academic risk taking tendencies of gifted students and their science learning orientations (p <.05, r = .430).

4. Discussion

In this research, it was aimed to investigate academic risk taking tendencies and science learning orientations of gifted students in laboratory activities. In this context, 187 gifted students who were studying at a SAC in Turkey participated to the study. When the findings

obtained were examined, it was concluded that the gifted students had high academic risk taking tendencies in the laboratory activities (Table 6). This result is similar to some studies (Akdağ, Köksal & Ertekin, 2017; Akkaya, 2016; Tay, Özkan & Tay, 2009). The high academic risk-taking tendencies of gifted students may be the result of their education which aims to develop skills such as solving problems by questioning (Schreglmann, 2016), transferring knowledge to changing situations and showing a tendency to choose compelling tasks (Coleman, Micko & Cross, 2015). Because gifted students actively participate in laboratory applications and projects at science and art centers besides their normal education (Barış, 2019; MoNE, 2016). It can be concluded that these practices and activities aimed at solving actual problems provide high levels of academic risk-taking for laboratory studies of gifted students. In support of this result, Tay, Özkan and Tay, (2009) stated that there is a positive relationship between problem solving skills and academic risk taking tendencies of gifted students.

Similarly, gifted students have a high science learning orientation (Table 6). In the process of examining science learning orientations, it is emphasized that self-efficacy, self-regulation skills, valuation and achievement goal orientations are important and these dimensions are indispensable elements in science teaching (Yetişir & Ceylan, 2015). It is stated in the literature that if the students value the course, they demonstrate the skills to organize the learning in line with certain goals and exhibit the necessary desire and courage in the subject, their orientation towards the course and academic achievement will be high (Arslan, 2011; İsrael, 2007; Sevil & Erdoğan, 2018). Therefore, it is expected that gifted students have high science learning orientations.

Regarding the gender variable, it was found that there is no significant difference between academic risk taking tendencies of male and female gifted students for laboratory activities (Table 7). This result is different from some studies (Clifford, Chou, Mao, Lan & Kuo, 1990) examining students' tendency to take academic risk but shows similarity with some other studies (Chou, 1992; Strum, 1971). These results reveal the inconsistency of whether students' academic risk taking tendencies show a significant difference in terms of gender. Therefore, it is important to carry out more studies on this issue. Similarly, there is no significant difference between the science learning orientations of male and female gifted students (Table 7). This is desirable in terms of gender equality. Therefore, it can be concluded that the intrinsic motivations, self-efficacy and self-regulation skills of male and female participants are similar. In the literature, while some studies reached similar results with the current research (İrven & Şenler, 2017; Kanat & Kozikoğlu, 2018; Kıran & Sungur, 2012), there are also other studies that reach different results (Anderman & Young, 1994; Britner & Pajares, 2006). Therefore, this inconsistency in the literature reveals the importance of further studies on this issue.

It was determined that the academic risk taking tendencies of the gifted students did not differ in terms of the program studied. This result shows that the students' academic risk taking level does not change as they move to higher education program and it differs with some studies in the literature (Beghetto, 2009; Byrnes, Miller & Schafer, 1999; Daşcı & Yaman, 2014). For example, Daşcı and Yaman (2014) examined the students' tendency to take academic risk in science course according to Piaget's cognitive development period and stated that the students studying at lower grades had higher academic risk taking levels compared to the students studying at higher grades. Researchers also stated that students' academic achievement can be increased by developing academic risk taking behaviors from young ages. Beghetto (2009), on the other hand, emphasized that academic risk taking behaviors increase as the grade level increase. These results indicate that there is no cetain relationship between program studied at SACS and academic risk taking behaviors. Nevertheless, it can be concluded that the main reason why the academic risk taking levels of the students for laboratory studies did not differ by the program variable is because similar learning environments including experimental practices, laboratory activities and projects, which enable students to take an active part in each program applied in

SACs. However, in order to obtain a clearer result, it is important to conduct studies examining the academic risk taking tendencies of different groups of students towards laboratory activities. Likewise, it was seen that the participants' science learning orientations did not differ in terms of the program they studied (Table 9). According to this result, it can be concluded that the science courses conducted at each program provide the students' inner motivation, self-efficacy and self-regulation skills.

5. Conclusion

It is determined that there is a moderate and significant relationship between academic risk taking tendencies and science learning orientations of gifted students (Table 10). According to these results, it can be concluded that high levels of academic risk taking tendencies are associated with higher levels of science learning orientations. Therefore, it is thought that the setting learning environments that will enable students to take academic risks in laboratory activities will make their learning meaningful and valuable (Wood & Bandura, 1989). Besides, it is emphasized that academic achievement of students with high science learning orientations will be continuous (Sevil & Erdoğan, 2018). In the light of all these assessments, it is important to create learning environments where students can take academic risks for the gifted students who have the potential to play important roles in the development of societies (Karakaya et al., 2018).

The following recommendations were made within the framework of the results of the research: In order to increase the academic risk taking skills of the gifted students in laboratory studies, projects and experimental practices should be given more attention in both schools and SACs.

The findings of this study are limited with the data collected from 187 gifted students who are studying at a SAC in Turkey. By extending the scope of the study, more reliable results can be obtained.

Quantitative research method was used in the study. It is important to investigate students' academic risk taking tendencies with in-depth research using qualitative research methods.

References

Abdullah, M., & Osman, K. (2010). 21st century inventive thinking skills among primary students in Malaysia and Brunei. *Procedia – Social and Behavioral Sciences*, *9,* 1646-1651.

Açıkgül, K., & Şahin, K. (2019). Investigation of secondary school students' perceptions on their mathematics-oriented academic risk taking behaviors in terms of gender, grade level, metacognition and attitude variables. *Adiyaman University Journal of Social Sciences*, *32*, 1-30.

Akbaş, M., & Çetin, P. S. (2018). The investigation of gifted students' argumentation level and informal reasoning related to socioscientific issues. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education*, *12*(1), 339-360.

Akdağ, E. M., Köksal, M. S., & Ertekin, P. (2017). Investigating gifted middle school students' intellectual risk taking behaviors in learning science across gender and grade, *Adnan Menderes University Journal of Social Sciences Institute*, *4*(2), 16-25.

Akkaya, G. (2016). *The effect of animations involving models on fourth grade gifted students' intellectual risk taking and learning in science courses*. Unpublished Doctoral Dissertation. İnönü University, Institute of Educational Sciences, Malatya.

Almeida, F., & Simoes, J. (2019). The role of serious games, gamification and ındustry 4.0 tools in the education 4.0 paradigm. *Contemporary Educational Technology*, *10*(2), 120-136.

Ames, C. (1992). Classrooms goals structures and student motivation. *Journal of Educational Psychology*, *84*, 261-271.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom students' learning strategies and motivation processes. *Journal of Educational Psychology*, *80*, 260-267.

Anderman, E. M., & Young, A. L. (1994). Motivation and strategy use in science: Individual differences and classroom effects. *Journal of Research in Science Teaching*, *31*(8), 811-831.

Arslan, A. (2011). Examining the achievement goal orientations and constructivist approach opinion of pre-service teachers. *Ondokuz Mayis University Journal of Education Faculty*, *30*(1), 107-122.

Atasoy, B. (2004*). Science learning and teaching*. Ankara: Asil publishing, 147.

Atkins, W. J., Leder, G. C., O'Halloran, P. J., Pollard, G. H., & Taylor, P. (1991). Measuring risk taking. *Educational Studies in Mathematics*, *32*, 297 -308

Avcı, E., & Özenir, Ö. S. (2016). Investigation of maths oriented academic risk-taking behaviours of secondary school students by some variables. *Turkish Journal of Computer and Mathematics Education*, *7*(2), 304-320.

Barış, N. (2019). *Investıgatıng science and maths teachers' stem education practices at BILSEM*. Unpublished Master Thesis Tezi. Hacettepe University, Institute of Educational Sciences, Ankara.

Beghetto, R. A. (2009). Correlates of intellectual risk taking in elementary school science. *Journal of Research in Science Teaching*, *46*(2), 210-223.

Bozpolat, E., & Koç, H. (2017). Study on the mathematics-oriented risk-taking behaviors of 8th grade students in view of certain variables. *Hacettepe University Journal of Education*, *32*(3), 525-543.

Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching*, *43*(5), 485-499.

Byrnes, J. P., Miller, D., & Schafer, W. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, *125,* 367-383.

_____

Chou, F. C. (1992). *Academic risk-taking as a function of evaluation assessment ratio and payoff increments*. UMI Pro Quest Digital Dissertations.

Clifford, M. M. (1991). Risk taking, theoretical, empirical, and educational considerations. *Educational Psychologist*, *26*(3&4), 263-297.

Clifford, M. M., Chou, F. C., Mao, K-N, Lan, W. Y., & Kuo, S-Y. (1990). Academic risk taking, development, and external constraint. *Journal of Experimental Education*, *59,* 45-66.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd Ed.)*. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Coleman, L. J., Micko, K. J., & Cross, T. L. (2015). Twenty-five years of research on the lived experience of being gifted in school: Capturing the students' voices. *Journal for the Education of the Gifted*, *38*(4), 358-376.

Cullin, M., Hailu, G., Kupilik, M., & Petersen, T. (2017). The effect of an open-ended design experience on student achievement in an engineering laboratory course. *International Journal of Engineering Pedagogy*, *7*(4), 102-116.

Çakır, E., & Yaman, S. (2015). The relationship between students' intellectual risk-taking skills with metacognitive awareness and academic achıevement. *Gazi Journal of Education Sciences, 1*(2), 163-178.

Çetin, B., İlhan, M., & Yılmaz, F. (2014). An investigation of the relationship between the fear of receiving negative criticism and of taking academic risk through canonical correlation analysis. *Educational Sciences: Theory & Practice*, *14*(1), 135-158.

Çınar, D. (2007). *The effects of the problem based learning approach on the higher level thinking skills and levels of academic risk taking in primary science education*. Unpublished Master Thesis Tezi. Selçuk University, Institute of Educational Sciences, Konya.

Daşçı, A. D., & Yaman, S. (2014). Investigation of intellectual risk-taking abilities of students according to Piaget's stages of cognitive development and education grade. *Journal of Theoretical Educational Science*, *7*(3), 271-285.

Deveci, İ. (2018). Middle school science laboratory academic risk taking scale: Validity and reliability study. *Elementary Education Online*, *17*(4), 1861-1876

Eugene, O. (2010). *Scientific risk-taking by young students fades with age*. https://uonews.uoregon.edu /archive/news-release/2010/4/scientific-risk-taking-young students-fades-age.

Fraenkel, J. K., & Wallen, N. E. (2006). *How to design and evaluate research in education* (6th Ed). New York: McGraw-Hill, Inc.

Freedman, M. P. (1997). Relationship among laboratory ınstruction, attitude toward science, and achievement in science knowledge. *Journal of Research in Scıence Teaching*, *34*(4), 343-357.

George, D., & Mallery, P. (2001). *SPSS for Windows. Step by step (third edition)*. USA: Allyn & Bacon.

Gupta, M., & Pasrija, P. (2016). Problem solving ability & locality as the influential factors of academic achievement among high school students. *Issues and Ideas in Education*, *4*(1), 37-50.

Hassi, A. (2016). Effectiveness of early entrepreneurship education at the primary school level: Evidence from a field research in Morocco. *Citizenship, Social and Economics Education*, *15*(2), 83-103.

Henriksen, D., & Mishra, P. (2013). Learning from creative teachers. *Educational Leadership*, *70*(5). http://www.ascd.org/publications/educational-leadership/feb13/vol70/num05/Learning-from-Creative-Teachers.aspx

Hills, T., Stroup, W., & Wilensky, U. (2005). *Patterns of risk seeking and aversion among preservice teachers: Mathematical decisions, preference, efficacy, and participation*. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, April.

Hirst, G., Van Knippenberg, D., & Zhou, J. (2009). A cross-level perspective on employee creativity: Goal orientation, team learning behavior, and individual creativity. *Academy of management journal*, *52*(2), 280-293.

İrven, Ö., & Şenler, B. (2017). Motivational beliefs and self-regulation skills of 4th grade students in science. *Trakya University Journal of Social Sciences*, *19*(2), 367-379.

İsrael, E. (2007). *Self-regulation instruction, science achievement and self-efficacy.* Unpublished Doctoral dissertation, Dokuz Eylül University, Institute of Educational Sciences, İzmir.

Kanat, F., & Kozikoğlu, İ. (2018). 8th grade secondary school students' self-regulation strategies, motivational beliefs and attitudes towards learning English. *The Journal of Erzincan University Education Faculty*, *20*(3), 725-748.

Karakaya, F., Ünal, A., Çimen, O., & Yılmaz, M. (2018). Investigation of environmental perceptions of gifted students and their peers. *Online Science Education Journal*, *3*(1), 25-32.

Kılıç, D. S., & Soran, H. (2011). Behavioral intention questionnaire for biology laboratory applications. Paper Presented at *2nd International Conference on New Trends in Education and Their Implications*, Antalya.

Kıran, D., & Sungur, S. (2012). Middle school students' science self-efficacy and its sources: Examination of gender difference. *Journal of Science Education and Technology*, *21,* 619-630.

King, W. R., & He, J. (2005). Understanding the role and methods of meta-analysis in IS research. *Communications of the Association for Information Systems*, *16*, 665-686.

Kinshuk (2016). *Designing adaptive and personalized learning environments (Interdisciplinary approaches to educational technology)*. Arbingdon, UK: Routledge.

Kwok, P. W. (2015). Science laboratory learning environments in junior secondary schools. *Asia-Pacific Forum on Science Learning and Teaching*, *16*(1), 1-28.

McKillup, S. (2012). *Statistics explained: An introductory guide for life scientists (Second edition)*. United States: Cambridge University Press.

Ministry of National Education [MoNE] (2016b). *Science and Art Center Guidelines.* Ankara: Ministry of National Education.

Ministry of National Education [MoNE] (2018). *Science course curriculum (Primary and secondary school 3, 4, 5, 6, 7 and 8 Grades)*. Ankara: Board of Education and Training.

Miller, D. C. & Byrnes, J. P. (1997). The role of contextual and personal factors in children's risk taking. *Development Psychology*, *33*(5), 814-823

Mun, Y. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International journal of human-computer studies*, *59*(4), 431-449.

Robinson, L. E., & Bell, A. (2012). Exploring adult risk propensity and academic risk-taking within the online learning environment. Paper presented at the *Adult Education Research Conference* (AERC) (pp. 258-264). Saratoga Springs.

Schreglmann, S. (2016). Content analysis of higher education thesis made about gifted students in Turkey (2010–2015). *Journal of Gifted Education Research*, *4*(1), 14-26.

Sevil, H. H. S., & Erdoğan, D. G. (2018). Investigation of middle school students' motivation towards science learning in terms of some variables. *Journal of Multidisciplinary Studies in Education*, *1*(1), 36-46.

Strum, I. S. (1971). *The relationship of creativity and academic risk-taking among fifth graders: Final report.* ERIC Document Reproduction Service No: ED046212.

Tay, B., Özkan, D., & Akyürek-Tay, B. (2009). The effect of academic risk taking levels on the problem solving ability of gifted students. *Procedia Social and Behavioral Sciences*, *1*(1), 1099-1104.

_____

Varışoğlu, B., & Çelikpazu, E. E. (2019). Secondary school students' academic risk-taking levels in Turkish lesson. *International Journal of Progressive Education*, *15*(4), 241-258.

Weiner, B. (1994). Integrating social and personal theories of achievement striving. *Review of Educational Research*, *64*(4), 557-573.

Wood, R., & Bandura, A. (1989). Impact of conceptions of ability on self-regulatory mechanisms and complex decision making. *Journal of personality and social psychology*, *56*(3), 407.

Yaman, S., & Köksal, M. S. (2014). Adaptation of the Turkish form of perception scale for mental risk taking and predictors in science learning: Validity and reliability study. *Journal of Turkish Science Education*, *11*(3), 119-142.

Yavuz, S., & Akçay, M. (2017). The investigation of the effects of computer-assisted instruction and laboratory instruction on students' achievement and students' attitudes towards the course. *Karaelmas Journal of Educational Sciences*, *5*(1), 39-48.

Yazıcı, M., & Kurt, A. (2018). Investigation of the effect of using the laboratory in secondary school science teaching to the academic achievements of the students in line with the opinions of teachers and students. *Journal of Bayburt Education Faculty*, *13*(25), 295-320.

Yerdelen, S., Aydın, S., Gürbüzoğlu-Yalmancı, S., & Göksu, V. (2014). Relationship between high school students' achievement goal orientation and academic motivation for learning biology: A path analysis. *Education and Science*, *39*, 437-446.

Yetişir, M. İ., & Ceylan, E. (2015). The adaptation of students' adaptive learning engagement in science scale into Turkish. *Elementary Education Online*, *14*(2), 657-670.

Young, R. D. (1991). *Risk-taking in learning*, K-3. NEA Early Childhood Education Series. National Education Association Professional Library, PO Box 509, West Haven, CT 06516.

Science Teacher Candidates' Skills to Ensure Method-Material Harmony and Integration

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Abstract

In this study, it was aimed to determine the harmony and integration levels of the material prepared by the science teacher candidates with the methodical approach they adopted. In this case study, the data was obtained from observations of material practices and documents introducing the materials. In the study of 41 teaching materials prepared by 3rd grade teacher candidates prepared at different levels considering the achievements of the Science curriculum, the data were analyzed by descriptive analysis, content analysis and the "methodological approach-material integration level" rubric developed by the researchers. In the findings it was determined that although teacher candidates design materials in three different categories in accordance with three different teaching approaches of science (discovery learning; inductive reflective materials, expository teaching; direct reflective materials, research method; multiple systematic reflective materials), they mostly use materials with inappropriate methodological approaches and low level of integration during the application process.

Keywords: science education, teaching method, teaching material, learning environment, teacher training undergraduate program.

1. Introduction

In the paradigm based on the constructivist learning theory that has become dominant in today's educational understanding, learning is based on the individual's own experiences and experiences (Bodner, 1986; Hand & Treagust, 1991). It is known that teaching environments that enable the active learning of individuals provide more efficient educational results (Açıkgöz, 2003). Therefore, the quality of learning depends on the learning environment primarily. The ideal learning environment is an environment where learning takes place at the highest level and there are regulations supporting learning (Zedan, 2010). While organizing an ideal learning environment, many factors such as thermal comfort, light, class objects, ventilation, technical equipment and teaching materials should be considered (Basque & Dare, 1998; Yenen & Dursun, 2018).

The essence of using teaching material is to facilitate the teaching and learning process. However, these materials should be prepared for the purpose of the teaching process by making reasonable estimates about how individuals learn, not as a decoration tool in the classroom (Amadioha, 2009). A purposefully and correctly prepared teaching material can be used for purposes such as drawing attention in the classroom environment, transferring information, giving clues about the subject, ensuring class participation, repeating what is learned, giving

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feedback and making corrections and assessments (Şahin & Yıldırım, 2004). Kablan, Topan and Erkan (2013) conducted a meta-analysis of the research on the use of materials. In their study benefits of materials used in teaching environment are listed as: facilitating learning, increasing interest and desire, providing active learning, supporting individual learning, providing real-life learning experiences, and developing critical thinking, problem solving and creativity skills. Among the results of the same study, it was seen that science education was one of the most effective results obtained areas of material use.

> • Science teacher candidates designed teaching materials in three different categories in accordance with three different teaching approaches (Discovery approach; Inductive Reflective Materials, Expository approach; Direct Reflective Materials, Research approach; Multiple Systematic Reflective Materials).
>
> • The materials designed by teacher candidates were mostly used with inappropriate methodological approaches and low level of integration.
>
> • In the study, an indicators list of suitability of science teaching materials to teaching approaches and a rubric that can be used to evaluate the levels of teaching approach-material integration were developed.

Organizing learning environments, an important component of effective classroom management, is one of the most valuable teaching skills that prospective teachers must acquire (Woodcock & Rupert, 2012). Within the General Competencies of Teaching Profession published by the Ministry of National Education (MNE) (2017), a competence statement was given as "prepares material suitable for the acquisitions under the title of competence to create learning environments which is one of the competences in the professional skills category." Therefore, considering the ability to prepare and use materials appropriate to the subject area and the needs of the students in creating effective learning environments, it is important for teachers to integrate qualified materials with the right methods and techniques in terms of the quality of teaching. The quality of teaching materials, teaching methods and techniques, the professional competencies of teachers determine the quality of the learning environment (Smith & Ragan, 2004; Yanpar, 2006). In other words, the trio of teachers, methods and materials are the main components of a good learning environment. Well-trained teachers need to be able to use appropriate teaching methods and techniques and appropriate teaching materials. Therefore, the undergraduate programs prepared for teacher training should include knowledge and skills for preparing instructional material and use of teaching methods.

In this respect, in Turkey in the Undergraduate Science Teacher Training Program, methods used in science education are taught in the content of Special Teaching Methods courses, on the other hand, the content focusing of material in teaching was taught within the scope of Instructional Technology and Material Design course (Council of Higher Education, CEH, 1997). However, the name of this course was changed to "Instructional Technologies" in the 2018 program. In addition, Design of Materials in Science Teaching course, which is an elective domain education course for instructional materials, was also included in the program (CEH, 2018). When both programs are compared, the following points draw attention in this context:

(1) In both programs, courses on teaching materials are given before the courses on domain-specific teaching methods.

(2) While there is no emphasis to "domain-specify" in previous program, "domain-specify" is frequently emphasized not only on the basis of methods and techniques but also on material design in the new program (CEH, 2018). When comparing the old program updated in 2007 and the new program updated in 2018, the following points draw attention in this context:

- In Teaching Practice I and II courses: "Making observation regarding domain-specific methods and techniques; making micro-teaching practices by using domain-specific teaching methods and techniques";
- In Teaching Technologies course: "Creating a storehouse of domain-Specific objects";
- In Material Design in Science Teaching course: "Domain-specific technological tools and materials (simulations, animations, virtual classrooms and laboratory environments, concept cartoons, scientific measurement tools, worksheets, slides, visual media tools, etc.) and other information Technologies (web 2.0 tools, mobile applications, student response systems, learning management systems, augmented reality applications, measurement and evaluation tools, etc.) that can be used in science education, classroom environments in which technology is integrated, interactive boards and training portals; using and developing domain-specific information technologies in science teaching."

It is remarkable that the domain-specificity is emphasized especially in Teaching Practice courses. This is an indication that use of domain-specific methods and techniques and the development of domain-specific materials is foreseen as a gain and competence in the future for prospective teachers. Because the development of positive attitude in science teaching depends on the methods and techniques used in the courses. One of the techniques that can be used in science teaching is to use material specific to the field (Ünal, Akıncı & Şahin, 2000).

In the literature, it is seen that a lot of research has been done on the instructional technologies and material design in the previous programs (Cabı & Ergün, 2016; Çalışoğlu, 2015; Duman, 2013; Özcan & Koştur, 2019; Özer & Tunca, 2014; Yanpar, Koray, Parmaksız & Arslan, 2006; Yelken, 2009). The results obtained from these studies show that this course generally improves the material design skills of prospective teachers. Although the design skills of the material are an important dimension, it is not an adequate dimension. Sufficient integration of a designed material into a suitable methodological approach is also important. As a matter of fact, teachers should consider the suitability of these materials for teaching objectives, teaching methods, students' characteristics and teaching environment while using educational tools (Yalın, 2004). From this point of view, when the science education literature is examined, no study focusing on the domain-specific teaching methods and material integration is found. In this respect, studies on domain-specific material and method integration can fill a gap. In this general framework, the skills of prospective teachers who do not receive a direct training on how to ensure the integration of methods and materials are worth investigating.

1.1 Purpose and research questions

In this study, it was aimed to investigate the science teacher candidates' teaching material application processes in terms of the quality of the prepared material, preferred methodological approach and method-material compatibility. In line with this purpose, answers to the following questions were sought:

(1) What are the methodological approaches that prospective teachers prefer in their material application processes?

(2) How is the harmony between the materials prepared by the prospective teachers and the methodological approach they prefer in terms of the structural properties of the materials?

(3) How is the harmony between the materials prepared by the prospective teachers and the methodological approach they prefer?

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2. Method

For the purpose of the research, it was decided that the most appropriate qualitative research pattern for this study, which has a qualitative nature, is a case study. According to Yin (2003), case study is a research method that examines a case, which is expressed as a case in qualitative research, in the context in which it is used, when more than one source of evidence or data is available. The cases examined in case studies may show structural differences expressed through research problems. Therefore, there are different examination patterns (Yıldırım & Şimşek, 2005: 290). Considering the research questions, it is seen that this study is oriented towards a holistic situation with different dimensions in the focus of the teaching material, such as the materials prepared by a certain group of prospective teachers, the methodological approaches they prefer in these material applications, and the nature of the materials in this methodological approach. For this reason, the preferred pattern is the Nested Single State Pattern.

2.1 *Participants and procedure*

The study was carried out with 41 pre-service teachers studying at the third grade in the Science Education program at a public university in Central Anatolia. The research was carried out within the scope of the Instructional Technologies and Material Design course conducted in accordance with the content defined by CEH (2007) (Appendix-1) in the fall semester of the 2017/2018 academic year. In accordance with the course content during the application hours of the course, in line with the principles of material development all participants were asked to take into account the subject areas and objectives given in the Science Education program (MNE, 2018) which was renewed. Objectives were selected from different science fields (chemistry, biology, physics, climatology, astronomy etc.) and different grade levels. Since there is no content that directly gives specific/general teaching methods to the scope of the course, no guidance or guidance was provided to the participants in introducing the methodological approaches to be preferred in the material application process. No evaluation and feedback has been made during the process. However, in order to examine the material application process in more detail, they were asked to make a plan that introduces the application and accordingly, before the application, each student was asked to prepare a presentation introducing the material prepared and containing information on how to use it in the lesson.

The process is as follows:

(1) Giving theoretical information (4 weeks);

(2) Time for participants to develop materials (7 weeks);

(3) Collection of material application reports and presentations (at week 7);

(4) Material applications (7 weeks);

(5) Sharing the material evaluations with the participants (in the 14th week).

2.2 *Data collection*

In accordance with the nature of the case study, the data in this study were provided from two sources: observations and documents.

2.2.1 *Observations*

Starting from the 7th week of the research process, each participant introduced his material first and then carried out the application he planned for the use of the material in the

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classroom. These applications were observed through a semi-structured observation form. The observation form contains three dimensions depending on the research problems. These are: *the methodical approach preferred by the participant in practice, the structural properties of the material, and the status of the material in the process*.

2.2.2 *Documents*

In the 7th week of the research process, application plans collected from the participants and presentation files used in the applications were used as data sources. These documents were prepared by the participants through a semi-structured framework, where the participants were previously given. This framework includes the following dimensions: the *relevant learning outcomes of the material, the process of making the material, its physical properties, its use in the teaching process, expectations of external learning outcomes from the material and subjective evaluation*.

2.3 *Data analysis*

Data analysis was carried out in three stages depending on research problems.

2.3.1 *Methodological approach in material applications*

In the observations and documents belonging to each participant, the data regarding the application processes of the materials were analyzed descriptively in terms of the methodological approach adopted in the application process. In descriptive analysis, themes were determined by taking into account the teaching strategies (Güneş, 2014) classified according to the cognitive learning approach in the literature, and the different methods and techniques (Özden, 2000) expressed under these strategies were taken as sub-themes. In this way, which strategy is appropriate for the participant's methodical approach was determined, and methodological approach in accordance with three themes was determined: *application through expository, application through discovery, and application through research*.

2.3.2 *Nature of material-method integration*

At the end of the first stage, the methodological approach used in the application of the materials prepared by each participant was determined. At this stage, the harmony of the material with this approach was examined. In the literature, evaluation criteria specific to ready-made teaching materials are mentioned in general (e.g., Seferoğlu, 2006). However, no criteria were found to be used both in evaluating the relationship between a material and the method in general, or in terms of evaluating science materials in general. Therefore, for the purpose of the study, in order to make an evaluation in terms of the harmony of the materials used with the preferred methodological approaches expert opinions were consulted. Interviews were held with five experts, including two educational sciences and three science education experts. The experts were asked two main questions: (1) what should be considered in the use of materials for instructional strategies? (2) which strategy and which materials should be preferred? In this context, harmony is dealt with in two aspects.

2.3.3 *Determination of the suitability of the materials to the method in terms of structure*

In line with the opinions obtained from semi-structured interviews with experts, firstly, indicators were revealed for the structural features that should be in a material suitable for each strategy.

Table 1. Methodological approach and appropriate material indicators

Methodological Approach	Structural Main Indicators of Appropriate Materials
Expository	*Direct reflective materials;* *structured materials that have a physical integrity, that directly reflect information to students, that students can use individually, or that the teacher himself can use. For example, fixed or moving models, banners, ready concept maps, diagrams, maps, etc.*
Discovery	*Inductive reflective materials;* *unstructured materials, which are made up of different parts and do not give a specific message alone, which should be brought together inductively and by using certain rules, thus revealing the message, allowing students to experience with the group. For example; play and activity sets, concept map components, open-ended worksheets, etc.*
Research	*Multiple systematic reflective materials;* *It refers to a cluster formed by combining objects that are either a kind of material in their own right or prepared as a material for a particular purpose. It is a sophisticated / multi-material material that can be used together in a systematic form, and allows flexible use, which allows to link different messages with each other. They allow students to experience and use individually or with a group. For example, the combination of materials in the first two groups.*

In all observation data and documents, content analysis was conducted by coding the information about the material, taking into account the indicators described above. In this way, the material type of each participant was determined.

2.3.4 *Determination of the level of harmony of the materials with the method in terms of usage*

In line with expert interviews, a rubric containing material adaptation assessment indicators and levels focused on methodological approach was prepared. Stages such as listing criteria, determining performance levels and obtaining expert opinions were taken into consideration in the preparation of rubrics (Goodrich, 2001). After the validity and reliability studies of the prepared rubric were completed, the data of each participant, which was classified in terms of methodological approach and material quality, were evaluated through this rubric. In this way, the harmony level of the materials to the methodological approach was determined.

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Table 3. Material integration levels in methodological approaches

Dimensions	Material Integration Levels and Indicators		
	High	Moderate	Low
Materials in Discovery Approach	*Using knowledge with student participation in all stages of the discovery process and evaluation / repetition (sampling, determining relationships, generalizing, deepening, transferring and testing etc.)*	Using with student participation at some stage of the discovery process	Using in the process of repeating or evaluating of information
Materials in Expository Approach	*Using information in all stages of the expository process and evaluation / repetition (identification, sampling and referring to new examples, etc.)*	Using information at a stage of the expository process	Using information in the stage of evaluation and repetition
Materials in Research-Based Approach	*Using with student participation in all stages of the question / problem solving process and evaluation / repetition (determining the question, defining the question, suggesting solutions, etc.)*	Using with student participation at one stage of the question / problem solving process	Using in the process of repeating or evaluating of information

2.4 *Validity and reliability*

Validity and reliability studies (Creswell, 2014; Miles & Huberman, 2014) such as expert review, data diversification, participant confirmation, independent coding suggested in qualitative research at the stages of this study were carried out as follows:

(1) During the data collection process; parallel observations were made by two researchers, observation data were compared, harmonized and integrated. Expert opinion was received in the structuring of the application reports prepared by the participants. On the other side, data collection was also been diversified.

(2) During the analysis process; in descriptive and content analysis, some of the data (data from 10 participants) were analyzed by an independent analyst, and a harmony between categories and themes was provided by researchers' analyzes. Besides, since the codes were obtained from the interviews with the experts in the content analysis, the prepared codes were confirmed to the experts. On the other hand, the methodological approach-material integration level prepared based on the information obtained from expert interviews was tested on the data of 5 participants the rubric. The results of the evaluation were compared with the expert evaluations made without rubric and the indicator of "using in repetition" was added to the low level. Rubric took its final form after the confirmation of the experts interviewed.

3. Results

After the descriptive analysis of the data, since there is no reference or behavior corresponding to certain teaching methods in the material applications and expressions of the participants, the methodological approaches are limited to the strategy level in order to protect the objectivity of the analysis. These are as follows; application by expository, application by discovery; application through research. The quality of material-method integration under the

titles linked to these preferred methodological approaches is given in the light of tables and data quotes.

3.1 *Materials in expository teaching approach*

Table 3. Materials in expository approach

Material Class	Integration Level to Methodological Approach		
	High	Moderate	Low
Direct reflective materials	-	-	M23-M41-M31
Inductive reflective materials	M7-M11	M6-M22-M27-M36-M5-M10	M19-M21-M24
Multiple systematic reflective materials	M26	-	M3

The most preferred methodical approach for participants in the material application process is the way of expository (N=22). When the materials used with this approach are analyzed, it is seen that inductive reflective materials are more. However, the integration levels of these materials with the method are mostly low.

For example, the statements of the participant regarding the use of such a material (M16, Appendix-2) prepared on Foods are as follows:

> *"Our material will be used for the 5th grade, after the subject is explained and 6 people will be selected from the students and each will be given cards. Then each student will choose four of the envelopes of vitamins... in this way, they will remember what they have learned before in the lesson."*

Material 16 was used as a reminder after the subject was traditionally processed. On the other hand, according to expert opinions, most of the direct reflective materials that are suitable for this methodological approach are at the low integration level. For example, the statements regarding the usage process of a participant who prepared such a material for the subject of the Circulatory System are as follows (M33, Appendix-3):

> *"After the lecture, students can use the material without teacher assistance. The student's interest in the subject increases. The permanence of the subject is increased."*

On the other hand, it is seen that two of these materials are sufficiently integrated into this approach, to which they are compatible. For example, the participant's statements (M2, Appendix-4) regarding a material prepared on the Digestive System are as follows:

> *"The material is designed to be used throughout the lesson. While the lesson is being processed, the students are provided with the figure to see which foods are exposed to which organs and what kind of digestion... In order to see this, they have to come and open the boxes on the model. In this way, their participation in the lesson increases as well. In the evaluation of the end of the lesson, the window in the brain of the human figure opens. This window contains pictures of nutrients (carbohydrates, fat, protein) placed upside down. Asking where these foods begin digestion and what type of digestion they are required to be adhered to the relevant organ. The nutrients here can be increased according to the class size."*

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3.2 *Materials in discovery learning approach*

Table 4. Materials in discovery approach

Material Class	Integration Level to Methodological Approach		
	High	Moderate	Low
Direct reflective materials	M2-M20	M1-M18-M29-M34	M33-M35-M32-M30
Inductive reflective materials	-	-	M4-M8-M12-M15-M16-M17-M25-M28-M37-M38-M39-M9
Multiple systematic reflective materials	-	-	-

Another methodical approach preferred by the participants in the material application process is the way of invention (N=16). The category of material that is compatible with this approach in line with expert opinions is inductive reflective materials. As seen in the table, inductive reflective materials are more. The level of integration of such materials with the method is mostly moderate, but there are also lower ones.

The statements of a participant about a material related to the Creatures and Life subject (M5, Appendix-5) used at the moderate level of integration are as follows:

> *"The material is designed to be used during the lesson. What is expected from the material is to attract the attention of the student and to grasp the subject. On the other hand, as the puzzle activity continues and the puzzle is completed, students will realize that a whole is made up of parts, they will perceive that their living spaces form a whole and that everything in nature is one of those parts, they will deduce how important individuals are."*

The participant statements regarding the material prepared for the topic of Creatures and Life (M7, Appendix-6), which have achieved high level of integration, are as follows:

> *"The first part of our material will be used when explaining the lesson, and the second part will be used at the end of the lesson. In this way, the first part allows students to see the parts, differences and properties of the cell by sensing them and to understand them. The second part allows both evaluation and deduction of organelles' new duties... Increases the power of thinking. They learn to work in a group and trust their group. Students will be asked each other to perceive their friends by asking questions, and their communication with their friends increases. It enables students to actively participate in the lesson."*

In the direction of expert opinions, two examples of multiple systematic reflective materials, which are not primarily recommended for the discovery approach, are encountered in this approach. The participant statements regarding a material (M26, appendix- 7) for Physical and Chemical Changes that have achieved high integration with the discovery approach are as follows:

> *"While explaining the concepts of physical and chemical change, the teacher explains the differences between the particle structure of physical and chemical change by using this material as well as the definition. However, he wants them to guess how the particles of matter can be after the change on the ground and make them with play dough. The teacher does the same in chemical change. He then directs it to the right shapes with directions. He allows students to define physical*

and chemical change... then uses other material (bottle game) to recognize these changes in our environment through questions."

It is seen that different types of materials with low integration are generally used for evaluation or repetition at the end of the lesson. Although the planning of the course is presented based on the discovery, the use of these materials is left to the end of the course.

3.3 *Materials in research approach*

Table 5. Materials in research approach

Material Class	Integration Level to Methodological Approach		
	High	Moderate	Low
Direct reflective materials	-	-	-
Inductive reflective materials	-	M13	-
Multiple systematic reflective materials	M40-M14	-	-

Another method which is rarely preferred by participants during the material application process is the research method (N=3). The category of material that is compatible with this approach in line with expert opinions is multiple systematic reflective materials. When the table is examined, it is seen that only two materials are used in this approach at the level of high integration.

For example, the participant statements about such a material (M14, Appendix-8) prepared for the Transmission of Electricity are as follows:

"Before the lesson, students will be asked to bring the items to be used in the construction of a part of the material with an assignment to be given to the students. Using these, the sub-part of the material (rail) will be created. The aim will be to investigate which materials transmit electricity. Students will be made to make predictions about whether the items, which are brought before the material is fully constructed, are conductive or insulating. Students will be asked about how to test them. Then, the first part that I prepared and the second part will be combined and tests will be made on the material. In the course of the lesson, by providing students to explain, interpret and draw conclusions from these observations, we enable students to make predictions, to make observations, to interpret the data obtained and to draw conclusions, in other words, to gain scientific process skills. With this simple and at the same time useful material we have prepared, students have the opportunity to control and experiment by changing variables. Their imagination develops. Since each group prepares their own materials, their self-confidence increases. It provides cooperation and solidarity. It makes the lesson interesting."

Other suitable material (M40, Appendix-9) is similarly made by students through research. On the other hand, it is seen that an inductive reflective material is used with moderate integration in this approach. The data excerpt about the use of this material, prepared on Electricity Transmission and Physical Events (M13, Appendix-10) is as follows:

"In order to prepare for the lesson, it is ensured to research whether the electricity is always transmitted in the same way. Some students are given the historical story

of electricity as a subject of research. Students are asked to prepare a presentation on this subject. Then, students are asked to fill the concepts in the information treasure box with their prior knowledge. Students then make predictions about which conductors are better conductors, on the conductor wheel. Finally, students can be shown the variables to which the bulb is connected in the simple electrical circuit. Factors affecting the conductivity are supported with examples from our daily life. At the end of the lesson, the images and questions in the Predict and Write box are gathered, new examples are discuss."

4. Discussion

The results obtained in this study can be summarized as follows; teaching materials prepared by science teacher candidates are divided into three different categories in accordance with three different teaching approaches. In this context, the materials are classified as follows; Inductive Reflective Materials suitable for the discovery approach, Direct Reflective Materials suitable for the expository approach, and, on the other hand, Multiple Systematic Reflective Materials suitable for the research approach. However, when looking at the application processes of the prepared materials, some problematic situations manifest themselves. Firstly, it is seen that the participants draw attention to carry out material applications without emphasizing a specific or general teaching method, and their methodological approaches remain at the strategy level. Secondly, most of the materials are not used with a methodical approach which is determined to be essentially appropriate. Another is the low integration of those used with the appropriate methodological approach into the teaching process. For example, Inductive Reflective materials in accordance with the discovery approach are applied by expository approach and are integrated at a low level in the process. In this way, it is seen that the potential of a quality material which is suitable for a more effective teaching strategy in science education is not transferred due to the wrong approach and wrong positioning in the process (e.g., at the end of the lesson). A similar situation is observed directly in reflective materials. Although these materials are suitable for the expository approach by their nature, they have been applied through the discovery approach and their integration has been low. On the other hand, although Multiple Systematic Reflective materials which are suitable for the research approach are very few, adaptation and integration problems have also been observed in this approach.

Considering the literature in the light of the results obtained within this framework, there are many theoretical and practical studies focused on topics; the process of developing teaching materials in general terms, the importance of the materials, their contribution to the teaching process and learning, teachers' level of using materials, their views on teaching materials, their creativity in developing materials, etc. (Çiftçi, Yıldız & Bozkurt, 2015; Fidan, 2008; İşman, 2003; Duman, 2013; Özer & Tunca, 2014; Yanpar, Koray, Parmaksız & Arslan, 2006; Yelken, 2009; Saritas & Polat, 2017; Kahyaoglu, 2011; Kazu & Yesilyurt, 2008). Despite the fact that there are unique studies about the frequency of science teachers' use and utilization of materials (Karamustafaoğlu, 2006), examination of the materials, which are produced by science teacher candidates, in terms of content messages and the items used (Özcan & Koştur, 2019), no studies on the integration of the methodologies and materials were encountered. In this respect, it can be said that the study results are quite original. Although there is no literature to compare study results, a theoretical evaluation of the results can be made.

When teachers use educational tools, they should consider the suitability of these materials for teaching objectives, teaching methods, students' characteristics and the teaching environment (Yalın, 2004). Therefore, in this study, the course taken by participant science teacher candidates can be expected to gain these skills. Studies on this course have shown that in many respects, prospective teachers contribute to their skills in developing and using materials (Çalışoğlu, 2015; Cabı & Ergün, 2016; Bozpolat & Arslan, 2018; Bektaş, Nalçacı & Ercoşkun, 2009;

Gömleksiz, Kan & Serhatlıoğlu, 2010; Güven, 2006; Saka & Saka, 2005). However, there is no evidence or emphasis on teaching method-material harmony and integration in the related literature. On the other hand, there is no response in this regard in the content of this course (CEH, 2007). In addition, although the prospective teachers who have prepared the materials are 3th grade students and have received a general education on methods (e.g., teaching principles and methods) within the scope of professional knowledge courses in previous years, the lack of such a dimension in the content of these professional knowledge courses can be considered as a reason of the lack of method-material harmony. The result obtained in the study shows that prospective teachers do not have the knowledge that they can associate the materials specific to the domain with a suitable method.

5. Conclusion

Consequently, considering the undergraduate programs (CEH, 2007; 2018) in which science teacher candidates are studying, there is no clear educational content regarding method-material integration. When the material application plans and application processes prepared by the participants for certain acquisitions are examined, method and material integration emerges as a problem. For this reason, it seems necessary to provide prospective teachers with training on the qualifications of domain-specific materials and their "skills" to ensure their harmony and integration with current methods. Science education is the domain that has relatively the most effective results in using materials. In order to increase this potential of science education, adding an elective course on method-material integration to undergraduate programs can be offered as a basic suggestion.

Acknowledgements

References

Açıkgöz, Ü. K. (2003). *Aktif öğrenme* [Active learning]. İzmir: Eğitim Dünyası Yayınları.

Amadioha, S. W. (2009). The importance of instructional materials in our schools: An overview. *New Era Research Journal of Human, Educational and Sustainable Development*, *2*(3), 61-63

Basque, J., & Dare, S. W. (1998). Environment and apparatuship information. *Journal of Distance Education*, *13*(1), 626-638.

Bektaş, F., Nalçacı, A., & Erçoşkun, H. (2009). Classroom teacher candidates' views on the attainments from "Teaching technologies and material development" Course. *Journal of Theoretical Educational Science*, *2*(2), 19-31.

Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education*, *63*(10), 873-878.

Bozpolat, E., & Arslan, A. (2018). Preservice teachers' views about the course teaching technologies and material design, *E-International Journal of Educational Research*, *9*(3), 60-84, https://doi.org/10.19160/ijer.463977

_____

Cabı, E., & Ergün, E. (2016). The impact of instructional technologies and material development course on the teacher candidates' concern about using educational technologies. *Başkent University Journal of Education*, *3*(1), 37-43.

Çalışoğlu, M. (2015). Opinion of preservice elementary teachers about the instructional technologies and material development course. *Current Research in Education*, *1*(1), 23-32.

CEH (1997). *Science education, education faculty teacher training undergraduate programs*. Retrieved from: https://www.yok.gov.tr/Documents/Yayinlar/Yayinlarimiz/egitim-fakultesi-ogretmen-yetistirme-lisans-programlari-mart-1998.pdf.

CEH (2007*). Education faculty teacher training undergraduate program*. Retrieved from: https://www.yok.gov.tr/Documents/Yayinlar/Yayinlarimiz/egitim-fakultesi-ogretmen-yetistirme-lisans-programlari-mart-1998.pdf.

CEH (2018). *Teacher training undergraduate programs*. Retrieved from: https://www.yok.gov.tr/kurumsal/idaribirimler/egitim-ogretim-dairesi/yeni-ogretmen-yetistirme-lisans-programları.

Çiftçi Ş, K., Yıldız P., & Bozkurt, E. (2015). Middle school mathematics teachers' opinions about using material. *Journal of Educational Policy Analysis*, *4*(1), 79-89.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th Ed.). Thousand Oaks, CA: Sage Publications.

Duman, G. B. (2013). Material development and effective use of materials in teaching Turkish as a foreign language. *Journal of Mother Tongue Education*, *1*(2), 1-8.

Fidan, N. K. (2008). Teachers' views with regard to the use of tools and materials in the primary level *Journal of Theoretical Educational Science*, *1*(1), 48-61.

Gömleksiz, M., Kan, A., & Serhatlıoğlu, B. (2010). Prospective teachers' opinions about the effectiveness of instructional technology and material development course to have them acquire principles of material preparing. *Electronic Journal of Social Sciences*, *9(*32), 1-16.

Goodrich, A. H. (2001, April 17). The effects of instructional rubrics on learning to write. *Current Issues in Education*, 4(4).

Güneş, F. (2014). Öğretim ilke ve yöntemleri [Teaching principles and methods]. In F. Güneş (Ed.), *Öğretim stratejileri* [*Teaching strategies*] (pp. 61-77). Ankara: Pegem Akademi.

Güven, S. (2006). The evaluation of teaching technologies and materials development course in terms of competencies it provides (a sample of Inönü Unıversity faculty of education). *The Journal of Turkish Educational Strategies*, *4*(2), 165-179.

Hand, B., & Treagust, D. F. (1991). Student achievement and science curriculum development using a constructivist framework. *School Science and Mathematics*, *91*(4), 172-176.

İşman, A. (2003), *Öğretim teknolojileri ve materyal geliştirme* [*Instructional technologies and material development*]. İstanbul: Değişim Yay.

Kablan, Z., Topan, B., & Erkan, B. (2013). The effectiveness level of material use in classroom instruction: A meta-analysis study. *Educational Sciences: Theory & Practice*, *13*(3), 1629-1644.

Kahyaoğlu, M. (2011). The views of elementary teachers on using new technologies in science and technology teaching. *EBAD-JESR*, *1*(1), 79-96.

Karamustafaoğlu, O. (2006). Science and technology teachers' levels of using instructional materials: Amasya sample. *Journal of Bayburt Education Faculty*, *1*(1), 190-101.

Kazu, H., & Yeşilyurt, E. (2008). Teacher's aims of using instructional tools and materials. *Fırat University Journal of Social Science*, *18*(2), 175-188.

Miles, M., & Huberman, A. (2014). *Qualitative data analysis* (2nd Ed.). London: Sage Publications.

MNE (2017). *İlköğretim kurumları fen bilimleri dersi öğretim programı* [*Science education curriculum of primary education institutions*]. Ankara: Talim ve Terbiye Kurulu Başkanlığı.

MNE (2017). *General Competencies of Teaching Profession*. Retrieved from: http://oygm.meb.gov.tr/meb_iys_dosyalar/2017_12/11115355_YYRETMENLYK_MESLEYY_GENEL_YETERLYKLERY.pdf

Özcan, H., & Koştur, H. İ. (2019). Analyzing pre-service science teachers' physics materials. *Science Education International*, *30*(1).

Özden, Y. (2000). *Öğrenme ve öğretme* [Learning and teaching] (8th ed.). Ankara: Pegem Yayıncılık.

Özer, Ö., & Tunca, N. (2014). The opinion of pre-service teachers towards preparing and using of materials. *Route Educational and Social Science Journal*, *1*(3), 214-229.

Şahin, T. Y., & Yıldırım, S. (2004). *Öğretim teknolojileri ve materyal geliştirme* [Instructional technologies and material development]. Ankara: Anı Yayıncılık.

Saka, A. Z., & Saka, A. (2005). Teacher candidates' level of development of their professional skills in instructional technologies and material development lesson: Sakarya sample. *Sakarya University Journal of Education Faculty*, 10, 81-177.

Sarıtaş, D., & Polat, M. (2017). Removing of misconceptions related with some basic science concepts with purpose-built science teaching materials. *Researcher: Social Science Studies*, *5*(10). 73-100.

Seferoğlu, S. (2006). *Öğretim teknolojileri ve materyal tasarımı* [Instructional technologies and material design]. Ankara: Pegem A Yayıncılık

Smith, P. L., & Ragan, T. J. (2004). *Instructional design* (3rd Ed.). MA: John Wiley & Sons.

Ünal, M., Akıncı, Ş., & Şahin, F. (2000, October). Biyolojik kavramların öğretilmesinde modellerin rolü: mitoz bölünme [The role of models in teaching biological concepts: mitosis]. *4th Science Education Congress*, MEB Basımevi, Ankara.

Woodcock, S., & Reupert, A. (2012). A cross-sectional study of student teachers' behaviour management strategies throughout their training years. *The Australian Educational Researcher, 39*(2), 159-172.

Yalın, H. İ. (2004). *Öğretim teknolojileri ve materyal geliştirme* [Instructional technologies and material development] (13th Ed.). Ankara: Nobel Yayıncılık.

Yanpar, T. (2006). Teknoloji tabanlı eğitim [Technology-based education]. In V. Sönmez (Ed.), *Eğitim bilimlerine giriş* [Introduction to educational sciences] (pp. 187-212). Ankara: Anı Yayıncılık.

Yanpar, T., Koray, Ö., Parmaksız, R. Ş., & Arslan, A. (2006). Investigation of hands-on and technology based materials prepared by preservice teachers with respect to the dimensions of creativity. *Educational Administration: Theory and Practice*, *45*(45), 129-148.

Yelken, T. Y. (2009). The effects of materials development based on "creativity activities within a group" on teacher candidates' portfolios. *Education and Science*, *34*(153), 83-94.

Yenen, E. T., & Dursun, F. (2018). Examination of teacher candidates' opinions on ideal education environment. *Journal of Social Sciences of Mus Alparslan University*, *6*(6) 1041-1049. https://doi.org/18506/anemon.421565

Yıldırım, A., & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in the social sciences] (9th Ed.). Ankara: Seçkin Yayıncılık.

Yin, R. K. (2003). *Case study research design and methods*. London: Sage Publications.

Zedan, R. (2010). New dimensions in the classroom climate. *Learning Environments Research*, *13*, 75-88.
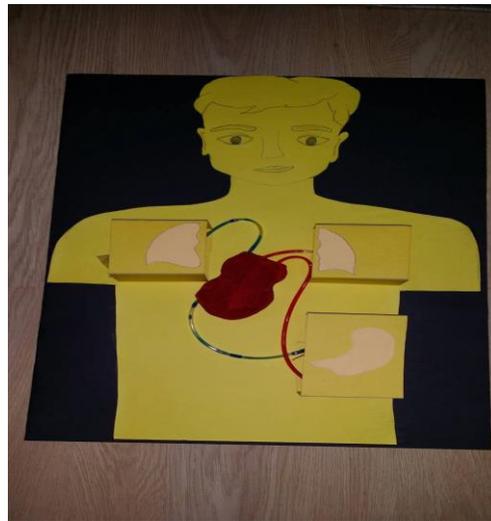
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Attachments

Appendix-1: Instructional Technologies and Material Design course content

"Concepts related to instructional technology, features of various instructional technologies, the place and use of instructional technologies in the instructional process, determination of technology needs of school or class, making appropriate technology planning and execution, developing two and three dimensional materials through instructional technologies (developing worksheets, designing activities, overhead transparencies, slides, visual media (VCD, DVD) materials, computer-based tools), examination of educational software, evaluation of instructional materials in various qualities, internet and distance education, visual design principles, research on the effectiveness of teaching materials, the use of instructional technologies in Turkey and in the world" (CEH, 2007).
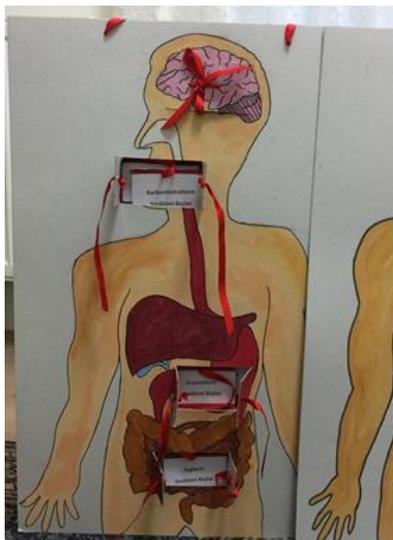
Appendix-2. M16	**Appendix-3. M33**
Appendix-4. M2	**Appendix-5. M5**

Appendix-6. M7

Appendix-7. M26

Appendix-8. M14

Appendix-9. M-40

Appendix-10. M13

A Study of Early Childhood Development Teachers' Experiences in Zimbabwe: Implications to Early Intervention and Special Education

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Abstract

This study examined Early Childhood Development (ECD) teachers' perceptions of ECD programs regarding benefits and opportunities for early intervention. Research indicates that young children with developmental delays and disabilities demonstrate better progress when intervention is offered early and in inclusive classrooms. A mixed method design was used to collect data from a purposeful sample of 81 ECD teachers in Chiping district, in Zimbabwe. Both descriptive and regression analysis methods were used for data analysis. Findings indicated that there was a general lack of in-depth knowledge, and most teachers did not follow developmentally appropriate curriculum. Threats and challenges included: lack of knowledge and assessments to diagnose developmental delays, disabilities, as well as lack of developmentally and culturally relevant teaching materials. Regression analysis indicated that age, experience, location, and training are important variables explaining perceived benefits of ECD. This study offers research-based ways to address challenges and threats to effective ECD programs.

Keywords: early childhood development, early intervention, exceptionalities, Zimbabwe.

1. Introduction

Early Childhood Education (ECE) known in most developing countries as Early Childhood Development (ECD) has now become a global imperative (Dakar Declaration, 2000; NAEYC, 2009; UNESCO, 2009; UNICEF, 2014), because it is vital for all children. The World Education Forum (2000) sets early childhood education as a priority goal for human development in all societies. Research-based evidence indicates that ECE supports developmental gains in language, cognitive, social, and emotional development, and forms the basis for future academic and social success (Eliason & Jenkins, 2012; Deiner, 2010; UNESCO, 2008). Early intervention is a useful practice in identifying and support children who have developmental delays and various exceptionalities (Turnbul, Turnbull, Wehmeyer & Shogran 2017). In addition, studies reveal that children who go through formal early childhood education do well in the first and subsequent

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grades (Anderson et al., 2003; Bakken, Brown & Downing, 2017). Most children master the literacy and other foundational skills during early education and that plays a tremendous role in their future learning and academic success (American Federation of Teachers, 2002; Young, 1996). All children, therefore deserve high-quality developmentally appropriate and culturally competent early childhood education; this is very crucial for children from low socio-economic and disadvantaged backgrounds, including those who are at risk and those with various disabilities. The purpose of the study was to examine ECD teachers' perceptions of ECD programs regarding the benefits, threats, and challenges as well as opportunities for early intervention.

1.1 Literature review

The philosophy behind Head Start programming in the USA, for example, is the idea of early exposure to foundational knowledge and skills for children from low-socio-economic backgrounds (Gargiulo & Kilgo, 2020). Research indicates that high quality and effective early education experiences help children from low socio-economic and disadvantaged backgrounds to overcome the influences of poverty (Children's Defense Fund, 2005; Shonkoff & Phillips, 2000), and early identification and intervention help children with delays, disabilities, and those at risk to minimize or overcome the challenges (Ramey, Campbell, Burchinal, Skinner, Gardner & Ramey, 2000; Turnbull, Turnbull, Wehmeyer & Shogren, 2013). For ECE to be implemented effectively, current early childhood research calls for early childhood teachers, caregivers, and all stakeholders to be knowledgeable in the areas of brain development (Gilkerson, 2001; Zambo, 2007), and social-emotional development (Gargiulo & Kilgo, 2020), for such kind of knowledge leads to developmentally appropriate practices.

Research on brain development indicates that brain growth is most dramatic in the early years before children start formal schooling (Gallagher, 2005). It is during the early years 0-5 years that rich experiences in the environment adds to the production of more synapses, which leads to brain growth and development (Colbert, 2008). Synapse refers to the connection points between the neurons. The greater the numbers in synapses, the greater the number and variety of messages to travel in the brain; making it possible for massive information processing (Bloom, Nelson & Lazerson, 2001; McDevitt & Ormrod, 2016; Tierney & Nelson, 2009). The synapses could be pruned and jeopardized when children are deprived of rich experiences from the environment, or when the environment does not offer developmentally appropriate learning experiences (Gilkerson, 2001; McDevitt & Ormrod, 2016). Children from disadvantaged backgrounds may have their synapses pruned early due to a lack of viable conducive learning environment suitable for brain development. Research has indicated that the early years are critical in the formation of intelligence, personality, social behavior, and physical development, and in forming the building blocks for dispositions and attitudes, which will persist throughout life (Hunzai, 2007; Woodhead, 2006). Therefore, early childhood is a critical period where effective early childhood education backed by brain research should be available for all children.

In the United States, where early childhood education is well established, education policy makers provided a platform advocating for early childhood education for all, including disadvantaged children, those with developmental delays and disabilities and that culminated in the inception of Head Start (Gallagher, 2005). Research completed in Head Start programs supports that early education is the time to provide early intervention and mitigate potential problems in children that might hinder learning later when they start first grade and start learning foundational and more challenging concepts. Eliason and Jenkins (2012) summarize the importance of early childhood education by indicating that early education mitigates problems by providing special programs that benefits children who are economically disadvantaged, those who are from poverty backgrounds; those with learning disabilities and other special education needs in inclusive environments.

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Since early childhood is a critical period, there is need for proper training for those who provide early education and early intervention (Eliason & Jenkins, 2012; Hyson, Tomlinson, & Morris, 2009). Likewise, Hyson, Tomlinson, and Morris (2009) note, "...a teacher's education, if it is rich and deep and positive, provides a critical foundation that may constructively influence children's experiences" (p. 30). However, research indicates that most early childhood education teachers and caregivers have not gone through proper teacher preparation programs (Tafera, 2018; UNESCO, 2015), this is not only a problem in developing countries, but also in developed countries (Macewan, 2015; Saracho & Spodek, 2007). Eliason and Jenkins (2012) writing about children in homes where both parents work or from single-parent homes note that "there is a need not only for more childcare programs, but also for upgrading the quality of childcare given. Because many young children are still cared for by untrained caregivers..." (p. 7). Given the importance of ECD, it was important to examine the current status of ECD in Zimbabwe from the perspective of early childhood teachers. In order to situate the purpose of the study, a detailed background of early childhood education in Zimbabwe is outlined next.

1.2 *Early childhood development in Zimbabwe*

ECD programming is fairly new, less than a decade old, in most African countries including Zimbabwe. As recent as 2004, Zimbabwe instituted ECD as a policy directed at all primary schools in order to create at least two ECD classes for children in the 3-5 years age group. The basis for the 2004 policy was a recommendation of the Commission of Inquiry into Education undertaken in 1999 (Nziramasanga, 1999). The Commission found that many children in rural and poor communities did not have access to early childhood services. The aim of the 2004 policy framework was to make official the ECD programs under the Ministry of Education, Sport and Culture (MoESAC), increase equity and access to ECD provisions, and enhance quality education.

Currently, ECD is divided into group *A* and *B* – of 3-4 year olds and 4-5 year olds, respectively (MoESC, 2005). The implementation of ECD classes has served as a vehicle to make pre-school education available to all children in Zimbabwe as recommended by the 1999 Presidential Commission of Inquiry into Education (Nziramasanga, 1999). Today, the MoESC fully supports the ECD policy, and follows the global trends in early childhood education; specifically, its advantages in preparing children for elementary/primary schools. The MoESC recognizes that ECD education can contribute significantly to the nurturing of young children's physical, social, emotional, intellectual, cultural, and cognitive abilities. The growth in ECD literature documents the efforts made by the Zimbabwean government alone, and in collaboration with organizations, such as UNICEF, to make ECD formal and available to the public as part of primary school education (Dyanda, 1999; Freitas, Shelton & Tudge, 2008; UNICEF, 2002; Zimbabwe MoESC, 2001).

The 2004 national ECD policy requires primary schools to offer a minimum of two ECD classes for children from 3 to 5 years old. According to the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) (2017), "ninety eight percent of primary schools are offering ECD classes" (par. 2). In support of this policy, primary teacher training colleges are now training ECD teachers who receive certified diplomas in ECD through the University of Zimbabwe. Universities in Zimbabwe (e.g., University of Zimbabwe and the Women's University in Africa) recently started new education programs in ECD. This new development will change the landscape of early childhood education in the country as graduates from these programs positively affect ECD. At the Women's University in Africa, for example, teacher candidates complete an ECD course that is relevant to exceptional learning (i.e., ECD, 2011: Special Needs Education) during the second year of their Bachelor of Education in the ECD program. As stated on their program website:

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> "The main objective of the course is to create awareness among students on the needs of exceptional children. They should be able to identify as well as facilitate early referral, which subsequently leads to early assessment as well as placement in relevant educational programs offered by the Ministry of Education, Arts, Sport and Culture. This course is in line with the Ministry of Education, Sport and Culture's policy of integration where emphasis is on educating the child in his/her environment whenever possible. Knowledge of different types of exceptional children should also help teachers to design appropriate learning programs that suit a particular child." (Women's University in Africa, 2011)

Such courses equip teacher candidates with relevant knowledge and appropriate skills needed for effective early childhood education. Given all the developments regarding ECD in Zimbabwe, not so much research has been conducted that investigates the utility of ECD programs from the perspective of ECD teachers; specifically what they perceive as benefits, threats and challenges, and how they identify children in need of early intervention.

1.3 *The purpose of the study*

The purpose of the study was therefore, to examine ECD teachers' perceptions of ECD programs regarding the benefits, threats, and challenges as well as opportunities for early intervention. Specifically, this study sought to address the following research questions:

(1) What are the benefits of ECD programs in Zimbabwe from the perspective of ECD teachers?

(2) Do ECD programs use developmentally appropriate curricula, methods, and intervention strategies that are appropriate for inclusive classrooms?

(3) Do schools have adequate resources for ECD classes?

(4) What are the teachers' perceptions about inclusion in ECD classrooms and ECD teacher training programs in Zimbabwe?

(5) What are the factors explaining teachers' perceptions about ECD programs and benefits in Zimbabwe?

(6) What opportunities can help alleviate the threats and challenges in ECD programs?

2. Method

2.1 *Research design*

In this study, a concurrent mixed method approach was employed in two phases. A concurrent mixed method design is a multi-strand design in which qualitative and quantitative data are concurrently collected and analyzed (Tashakkori & Teddlie, 2003). The first phase of data collection from a purposeful sample of eighty-one ECD participants. In this study, a survey instrument with both open-end and closed-end interview questions was used to collect data in the first phase. In the second phase, qualitative data were collected by way of semi-structured interviews from a typical sample of six key informants. The key informants were purposefully selected teachers with varying teaching training and experience in ECD in the district of Chipinge, in Zimbabwe. A typical sample would be one that is selected because it reflects the average person, situation, or instance of the phenomenon of interest (Merriam, 1998). Interview questions were developed based on the inferences from both qualitative and quantitative data analyses from the first phase.

2.2 *Participant selection*

The researchers sought permission from the MoESC, headmasters and private owners of ECD programs before issuing paper-based consent forms and surveys to the teachers. The consent forms indicated that the study was voluntary, and by completing the survey, they were giving their consent. However, they were free to withdraw from the study at any time. Teachers were given a week to turn in their completed surveys at the principal's office or the administration office of their ECD program. Two groups of ECD teachers: Those who teach group *A* (3 years old) and those who teach group *B* (4-5 years old) sample participants were surveyed from Chiping district, located in Manicaland province in Zimbabwe. Eighty-one teachers returned viable surveys and became the sample of the study. Out of the eighty-one teachers who took the survey, thirty six teachers had not gone through prior ECD teacher training programs. The sample consisted of 40 group *A* teachers and 41 group *B* teachers. Among group *A* teachers, 20 were urban teachers and 20 were rural teachers; group *B* had 21 urban and 20 rural teachers. The teachers' ages who were selected and surveyed were between 22 years and 60 years old. The average class size for each teacher was 25 children per class.

3. Data collection and analysis

The study used both descriptive and regression analysis techniques to address the questions raised above. The descriptive analysis component comprised of simple tables and graphs showing frequency distributions. We used regression analysis methods to examine the determinants of teacher's perceptions of ECD programs and the associated benefits. Due to the subjective questions that we are asking (i.e., how the dependent variable is measured), we prefer to use a logit model. Alternatively, we can employ multiple regression analysis using ordinary least squares, but the interpretation of the coefficients would not be easy since we are dealing with a variable that is unobservable. We assume that the teacher's perception about ECD programs and benefits is unobservable and thus we ask a number of questions associated with the teacher's perception. To derive the dependent variable, we used factor analysis of the questions associated with the benefits of the ECD program (see Table 2). The variable was rescaled so that it lied between 0 and 100 for easy interpretation. If the dependent variable is 1, if the index is above 50 and zero otherwise. Thus, the benefits are realized when the index is greater or equal to 50 and hence the dependent variable is 1, otherwise the benefits are insignificant. The dependent variable is re-defined as follows:

$$D_i = \begin{cases} 1 & if \ B_i \geq 50 \\ 0 & if \ B_i < 50 \end{cases}$$

where D_i is a "placebo" variable and B_i represents the teacher's perception of ECD program and benefits from ECD learning. To model the relationship between ECD benefits and teacher characteristics, the paper used the logit model and ordinary least squares (OLS) regression for comparison purposes. We assumed that actual ECD benefits are unobservable, but what teachers observe are the variables in Table 3, that is $D_i^* = X_i \alpha + \varepsilon$ and so $D_i = 1 \ if \ D_i^* > 0$, which implies that $B_i \geq 50$ and zero otherwise. If we assume that $\varepsilon_i \sim \Lambda(0,1)$ then:

$$\Pr(D_i = 1 \mid X_i) = \frac{\exp(X_i \alpha)}{1 + \exp(X_i \alpha)}$$

It immediately follows that

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$$\Pr(D_i = 0 \mid X_i) = 1 - \frac{\mathbf{exp}(X_i\alpha)}{1 + \mathbf{exp}(X_i\alpha)}$$

So that the odds ratio becomes

$$\mathbf{exp}(X_i\alpha) = \frac{\Pr(D_i = 1 \mid X_i)}{\Pr(D_i = 0 \mid X_i)}$$

$$= \frac{\pi_i}{1 - \pi_i}$$

Intuitively

$$\ln odds(D_i = 1 \mid X_i) = \alpha_0 + \alpha_1 Age + \alpha_2 Experience + \alpha_3 Location + \alpha_4 Training + \varepsilon_i$$

A comprehensive survey of the literature was done to gather key explanatory variables that could be used in the regression model. Experience and location were positively correlated with early childhood education or ECD benefits (Gallacher, 1997; Sheridan, Edwards, Marvin & Knoche, 2009; Welch-Ross, Wolf, Moorehouse & Rathgeb, 2006). Sheridan, Edwards, Marvin and Knoche (2009) established that training is positively related with ECD benefits. The variable age had mixed results. Table 1 summarizes the explanatory variables and provides the expected signs.

Table 1. Summary of variables

Variable	Explanation	Expected sign
Perceived benefits of ECD	Dependent variable	
Explanatory variables		
Age [no. of years]	Age of the respondent	±
Experience [no. of years]	Teaching experience of the respondent	+
Location [0=rural, 1= urban]	Location of the respondent	+
Training		
Degree	ECD teacher with degree	+
Diploma	ECD teacher with diploma/certificate	+
Vocational training	ECD teacher with vocational training	Undetermined
No training	ECD teacher without training	-

3.1 *Instrument*

Subject matter experts assessed content validity of the survey instrument designed for data collection to ensure that the instrument measured what it intended to measure. Content validity is the degree to which a test measures an intended content area or the extent to which a measurement reflects specific intended domain of content (Gay, Mills & Airasian, 2008). The survey instrument was pilot-tested using a convenient sample of teachers to ensure reliability. Pilot testing helped to determine that the participants of the study would be capable of completing the survey and that they could understand the questions (Cresswell, 2011). The survey allowed the researchers to collect quantitative and qualitative data simultaneously. Closed-end questions included 10 Likert scale items and an environmental checklist with 20 items. The Likert scale provided information about teacher attitudes, and understanding of the benefits of ECD. The checklist provided information about developmental appropriateness of the ECD environmental

contexts, specifically the physical environment, curriculum, methods, and intervention strategies. Five open-end questions probed more deeply and explored the participant's perspectives and experiences with ECD without constrain. Closed-end questions were analyzed using descriptive statistics and the teacher narratives on open-end questions were coded and analyzed for themes and commonalities as suggested by Saldana (2009). Based on the initial survey results, the researcher selected six participants for one-on-one semi-structured interviews which lasted approximately 45 minutes. Probing questions were used during the interviews in order to access an in-depth understanding of the phenomenon understudy (Patton, 2003). Interviews were transcribed, and data were coded and analyzed for themes and commonalities (Saldana, 2009).

4. Findings and discussion

4.1 *Characterization*

Table 2 characterizes the sample of ECD teachers that participated in the survey between May and July 2018. The results show great variability. The mean age of the sample is 44 years, while the average number of years in school (i.e., the mean years they had spent teaching in the school) is 13 years. About 53% of the respondents were urban ECD teachers and 66% had received ECD training. The variable for ECD benefits recovered using factor analysis was below 0.5 implying that the perceived benefits were low. This figure could be affected by the huge number of untrained and vocational ECD teachers in the sample.

Table 2. Teacher characteristics

Variable	Obs	Mean	Standard deviation
Age	81	43.74	13.254
Experience [no. of years]	81	4.915	2.432
School [no. of years in school]	81	13.025	3.125
Location [0=rural, 1=urban]	81	0.632	0.362
ECD training			
Degree	10	0.128	0.012
Diploma	18	0.227	0.121
Vocational	24	0.301	0.071
No training	29	0.3440	0.214
Total	81	0.656	0.456
ECD benefits	81	0.4215	0.231

Source: survey data

4.2 *Teacher perceptions on the benefits of ECD Education*

Quantitative descriptive analysis of the closed-end questions indicated that a majority of the teachers believed that ECD education was important and necessary for preparing children for later primary school success (see item 1-4 in Table 3). These findings (item 1-4) are similar to what Mushoriwa and Muzembe (2011) found; however, the difference in the current findings is that the majority of teachers did not believe that ECD training provided a strong basis for early intervention (see item 5-8 in Table 3). This is a point of concern because early childhood education should provide early intervention for children who are "at risk" or who have a high probability of developing learning and development disabilities (Deiner, 2012; Gargiulo & Kilgo, 2011). Also in this study, most ECD teachers were undecided as to whether the curriculum lays a strong foundation for first grade (see item 3) or whether the curriculum they used aligned with what children covered in first grade. This questions the sequencing and connection(s) of ECD curriculum with the 1st grade curriculum at teacher preparation programs.

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Table 3. Teacher ratings regarding the importance and benefits of ECD

Item	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
1. ECD education is important and necessary to all children.	95	5	0	0	0
2. ECD prepares children for later primary school success (e.g. success in 1st Grade)	80	10	10	0	0
3. The ECD curriculum for A and B classes lays a strong foundation for 1st Grade	5	35	60	0	0
4. Children who go through ECD have less difficulties adjusting to formal schooling.	75	0	20	5	0
5. Children with special needs are identified early during ECD	0	0	40	0	60
6. ECD provides positive behavior supports for children at risk of behavioral problems in 1st Grade.	10	10	20	0	60
7. Children with special needs who go through ECD are likely to do better in academic work.	80	10	0	10	0
8. Early intervention is provided through ECD.	0	0	10	50	40

Source: survey data

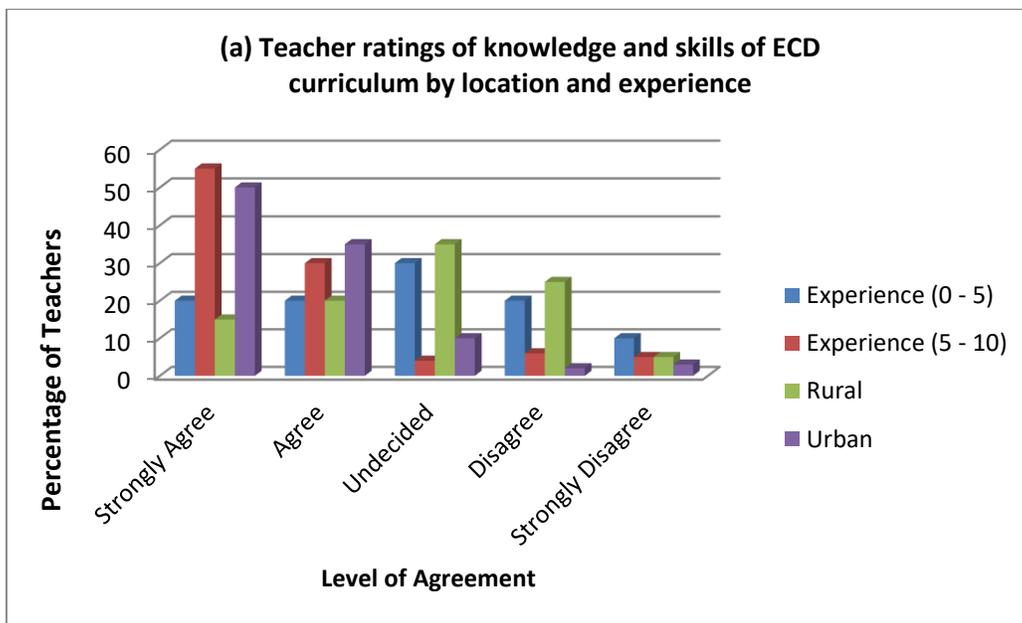### 4.3 *Teacher knowledge and skills of ECD curriculum*

Teachers rated their levels of knowledge and skills regarding ECD curriculum (see Table 4). More than seventy percent of the teachers indicated that they were either not sure (for instance; undecided, disagreed, or strongly disagreed) of the curriculum.
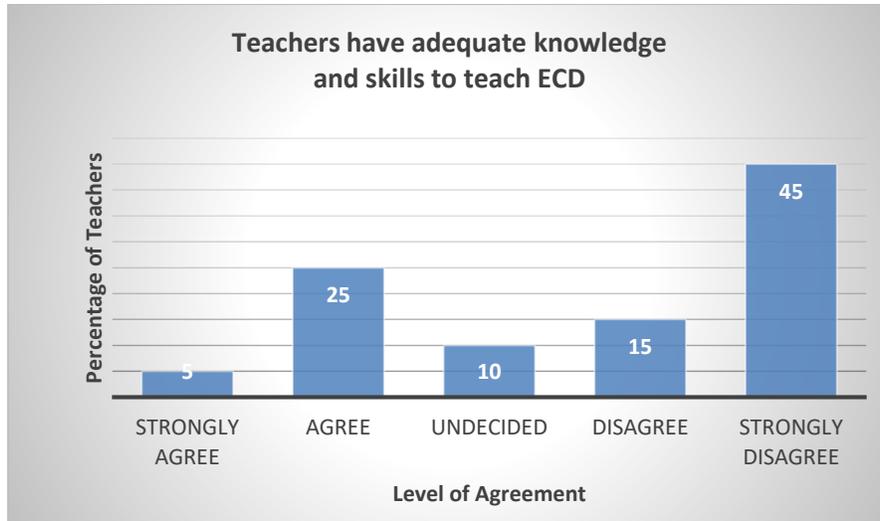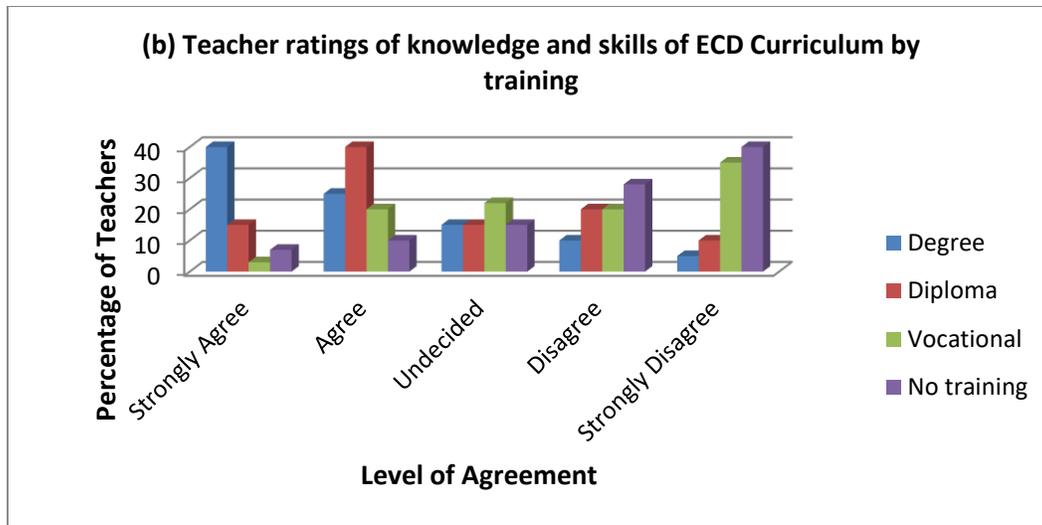
Source: survey data

Figure 1. Teacher ratings regarding their level of knowledge and skills of ECD curriculum

Figure 1 shows that most respondents, about 45%, strongly disagreed with the idea that teachers had adequate knowledge and skills of ECD curriculum. Disaggregating the results by number of years in teaching and location, Figure 1a shows that experienced teachers in urban areas believed that they had the required knowledge and skills of ECD curriculum. This could be because those teaching in urban areas attended more professional development. Analysis by category of teacher revealed that teachers with no training were the majority who strongly disagreed that they had the knowledge and skills of ECD curriculum, followed by those who went for vocational training, whose majority were uncertain (see Figure 2b).

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(b) Teacher ratings of knowledge and skills of ECD Curriculum by training

Figure showing a bar chart with "Percentage of Teachers" on the y-axis (0 to 40) and "Level of Agreement" on the x-axis (Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree). Legend: Degree, Diploma, Vocational, No training.

Source: survey data

Figure 2. Teacher ratings of knowledge and skills of ECD curriculum

Data in Figure 1 was corroborated by qualitative data from the open-end questions and interviews, where most teachers indicated that they had not gone through extensive formal training. One teacher said:

I have gone to the training several times but I cannot say for sure if what I know [curriculum] is preparing them [children] well for grade one…for us working with Group A [3-4 year olds] *they do not require a diploma or degree…*

Another teacher said:

I have not gone to college but to workshops…. I ask other ECD teachers what they are teaching and that is what I do with my children. …yes, I follow curriculum books but sometimes we do not have materials listed in the books…They come to supervise what we do with children no one has ever said anything…I think we are doing well.

One Group *B* teacher said:

I have a diploma from […Teacher's College]. *We learnt a lot about children and how they develop…The books that we are using in this school are different from what we used in college…sometimes it is difficult to figure out the connection between what we learnt and what we are supposed to do with these children. I took one course in special education…We did not use any assessments on our own to diagnose students who need early intervention.*

Another teacher said:

…in college we did not have students to practice what we were learning. At the moment I am learning on the job…none of the things that we were learning work. After our teaching practice [Field Experience] *some* [teacher candidates] *raised the concern …I am not sure if some of our lecturers were trained to teach ECD or first grade and up…you never know.*

Qualitative data indicates that ECD teacher training and professional development programs grappled to offer high quality curricula that equip teachers with proper child development knowledge and skills. Some teachers found it difficult to connect theory to practice. If early education served to prepare children for future success, help to identify those who needed early intervention, and give the necessary skills to those children from disadvantaged background,

then ECD teachers should be better prepared. Research indicates that when early childhood teachers go through quality and comprehensive teacher education programs, are equipped with child development knowledge and skills, and exhibit appropriate disposition and behavior, they positively impact children's development and learning (Hyson, Tomlinson & Morris, 2011; Wilson, Pianta & Stuhlman, 2007).

4.4 *Do schools have adequate resources for ECD classes?*

Table 4a shows the variables that were collected as part of an environmental checklist adapted from *Early Childhood Environmental Rating Scale* (Harms, Clifford & Cryer, 2015). A descriptive analysis of the environmental checklist (see Table 4b) indicates that most ECD classroom and outdoor learning environments did not have adequate teaching and learning materials, good sanitation, meals, and appropriate accommodation for children with learning disabilities.

Table 4a. Environmental checklist

| **Space and Furnishings**	1.Furnishings for relaxation and comfort (e.g. beds, blankets, etc) 2. Space for gross motor play 3. Gross motor equipment 4. Indoor space 5. Furniture for routine care, play, and learning (e.g. little chairs and tables that are at the level of children, toys)
Personal Care Routines	7. Meals/snacks 8. Nap/rest 9. Toileting (e.g. toilet papers, washing soap, diapers, etc)
Sanitation	10. Toilets for children separate from adults 11. Clean Water 12. Sinks (or places to was hands)
Teaching materials	13. Developmentally and culturally appropriate reading books 14. Stationary (e.g. crayons, note parts, art books, etc.)
Program Structure	15. Accommodations and provisions for children with disabilities 16. Provisions for parents (e.g. Information) 17. Opportunities for professional growth 18. Supervision and Evaluation of ECD Staff (e.g. ECD are frequently observed, and supervision is given is a helpful).

Source: Harms, Clifford & Cryer (2015). *Early childhood environmental rating scale.*

Table 4b. Environmental checklist to determine the appropriateness of ECD environments

Item	Percent of Teachers				
	Inadequate	*Minimal*	*Good*	*Excellent*	*Total*
Space and Furnishings	70	0	20	10	100
Personal Care Routines	60	0	40	0	100
Sanitation	90	0	10	0	100
Teaching materials	70	0	20	10	100
Program Structure	80	0	10	10	100
Overall	**74**	**0**	**20**	**6**	**100**

Source: survey data

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The results from the environmental checklist indicate that ECD environments were poorly equipped. Lack of sanitation was a devastating issue found to be an overarching theme in the study conducted by Rwatirera, Ngweni and Dhlomo (2011), which focused on rural primary schools. The current study included both urban and rural participants, and findings indicate that the issue of sanitation was not peculiar to rural schools. There was poor sanitation even in urban schools; only 10 % of the teachers from urban schools indicated that they had good sanitation. According to Adams, Bartram, Chartier and Sims (2009), children's ability to learn may be affected by inadequate water, sanitation, and hygiene condition, and this is profound when there are students with disabilities in the school where there is no universal design of the environments. Adams et.al note that, "Toilets that are inaccessible often mean that a disabled child does not eat or drink all day to avoid needing the toilet, leading to health problems…thereby dropping out of school" (p. 5). For other materials such as furniture, toys, and books, teachers can improvise and use what they have locally; however, that is not true for sanitation. If there is no clean water, inadequate toilets, and other sanitation materials such as soap or washing basins, there is little that teachers can do. Most of the boreholes or wells for clean water were donor funded (Gunhu, Mugweni & Dhlomo, 2011) – one of the leading donor (International Development Agent) in Zimbabwe and Africa in general is UNICEF. Due to lack of funding, schools do not repair boreholes once they break down.
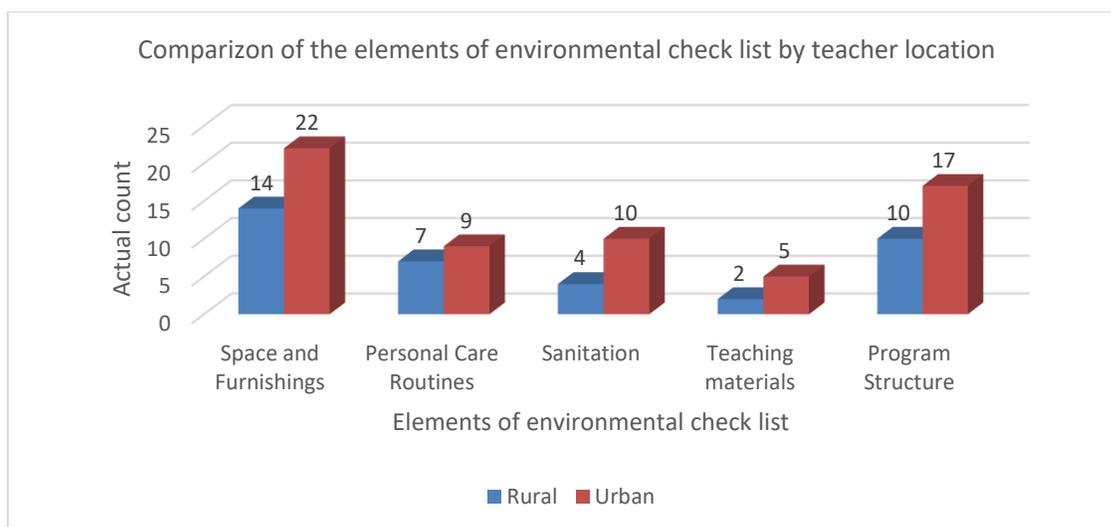
Source: survey data

Figure 3. Comparison of the elements of environmental check list
by teacher location (actual count)

4.5 *Lack of parental involvement*

Accumulated research indicates that parental involvement in children's programs is critical to the educational success of children (Daniel, 2009; Kniepkamp, 2005; Kostelnik, Soderman & Whiren, 2011, Turnbull et. al., 2019). SACMEQ (2017) reports that in Zimbabwe "Workshops for parents to appreciate the importance of ECD education have been conducted country wide" (par. 2). Parents may appreciate the value of ECD without understanding that their involvement is crucial. The findings indicate that parents are not involved much in the education of their children especially in rural areas (see Figure 2). The program structure as indicated in Table 5a shows that the ECD programs did not stipulate the level of parental involvement, neither were parents well informed about the ECD program. The qualitative findings present a different picture. It is not the problem of teachers not sharing information with parents, but the parents'

attitudes and beliefs about their involvement in their children's education. Many teachers indicated that parents believed that they did not have to help the teacher since teachers received salaries to do their jobs, and some felt they could not help because they did not have the knowledge to teach children. One urban teacher said:

> *Parents never come in to the classroom to help. They wait outside when they bring the child or when they come to take the child home…*

Another teacher said:

> *I have never met the parent…the maid brings the child to school…*

Teachers in rural schools indicated that children came with their older siblings to school and there was no chance of meeting parents as they were involved in subsistence farming or harvesting. One rural teacher said:

> *Most children come to school with their older siblings…the only time you get to meet the parent is when they come to register the child or when there is a school development association (SDA) meeting.*

Another teacher said:

> *Children from different compounds walk in groups and there is no need for parents to bring them to school…they protect each other…their parents work in tea estates* [picking tea].

Only thirty-percent of the teachers rated the level of parental involvement to be good. These teachers were urban teachers. However, qualitative data provided a different insight. Though 30% of the urban teachers indicated that ECD parents were involved in the education of their children, the quality of involvement was not what research recommends in developmentally appropriate practices in early childhood education. Research recommends that parents should collaborate with teachers to design interventions extended from school to the home environment (Fettig & Ostrosky, 2011), assist children with homework in order to internalize the material completed in class by going through the activities several times on a daily basis, particularly with difficult concepts. Instead, urban parents, as reported by ECD teachers, got involved to organize events such as end-of-year Christmas parties, birthday parties, and other events which were not related to the teaching and learning of the children. One teacher said:

> *Many parents come to help during parties like if their child has a birthday or if we are having parents' day…some come for prize-giving day.*

Another said:

> *I have seen many parents helping to organize Christmas party …some parents come because they want their child to be in a Christmas play…*

Meaningful parental involvement goes beyond participating in special events; rather, there should be a strong partnership and collaboration between parents and teachers. Research indicates that successful inclusive early childhood professionals collaborate with parents in the designing and implementation of their children's curricula (Eliason & Jenkins, 2012; Kostelnik et al., 2011). Parents know their children better and their contributions to the curriculum strengthens the quality of teaching strategies and individualized materials to be used by the teacher (Copple & Bredekamp, 2009). Successful early childhood programs collaborate with parents and encourage parents to teach their children at home as a way to help children increase cognitive and adaptive skills across different environments (Henninger, 2009; Widerstrom, 2005). Partnership and collaboration between families and professionals during early childhood years have several benefits including enhancing the family's quality of life, and gains in child skills such as language, self-help, social, motor pre-academic skills, etc. (Turnbull, Turnbull, Wehmeyer & Shogren, 2013).

4.6. *Regression analysis*

In this section, a simple logit model was used to analyze the factors explaining the teacher's perception of ECD programs and associated benefits. Several tests were conducted to confirm the validity of the model in question. The results in Table 5 indicate that the model explains about 53.7% of the variation in the dependent variable. The results show that being an urban ECD teacher increased the probability of perceiving ECD as beneficial. Again, experienced teachers had a higher probability of perceiving ECD as beneficial. The probability of perceived ECD benefits is higher for trained ECD teachers with degrees and diplomas than it is for untrained ECD teachers (no training is used here as the base category). Furthermore, the coefficient for vocational trained teachers is insignificant suggesting that there could be no significant difference between vocational training and no training, i.e., the training given to vocational trained ECD teachers was inadequate.

Based on the regression results, several policy implications can be drawn. In the short-run, there is need for policymakers to design comprehensive training programs for vocational and untrained teachers tailor made to suit their needs and equip them with the knowledge, technical skills, and theory of ECD programs, while at the same time increasing the contact hours with the trainees. In the long-run, all untrained and vocational trained teachers should undergo training similar to a certificate or diploma in ECD. Furthermore, the trained teachers should frequently attend professional development refresher courses in order for them to stay updated with advances in the field.

Table 5. Logit model results (Dependent variable: Perceived ECD benefits)

Explanatory variables	Logit
Age	0.026^{**}
	(0.924)
Experience	0.642^{**}
	(0.748)
Location	0.083^{***}
	(0.809)
Degree	0.736^{***}
	(0.936)
Diploma	0.64^{**}
	(1.816)
Vocational	-0.260
	(0.568)
Constant	0.881^{*}
	(0.706)
Pseudo R²	0.537
L R Chi2 ()	19.45
Prob > Chi2	0.0016
Observations	81

Source: survey data
* 10% significance level, ** 5% significance level, *** 1% significance level

5. Summary of findings

Based on the findings, ECD teachers perceived early childhood education to be beneficial to children's development, and that it could afford opportunities for early intervention, and lay the building blocks for future success. However, the teachers agreed that the ECD teacher training programs were not offering enough preparation on strategies and early intervention for children with disabilities. In addition, schools did not have enough infrastructure to provide

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developmentally appropriate curricula. Therefore, inclusive education in ECD classrooms is not effectively implemented.

Regression analysis results confirmed that being an urban ECD teacher increased the probability of perceiving ECD as beneficial. Furthermore, experienced teachers had a higher probability of perceiving ECD as beneficial. The probability of perceiving ECD as beneficial was higher for trained ECD teachers, with a diploma or degree, than it is for untrained ECD teachers (the no training is used here as the base category or reference upon which we compare the other three categories), while the results for vocational trained teachers are insignificant. This result seem to suggest that there is little difference between untrained and vocational trained teachers in terms of the teacher's perception of ECD programs and associated benefits.

A way forward

In order for ECD to be more effective in Zimbabwe, there is need for those who form education policies, and other stakeholders to review the early childhood teacher preparation curriculum. The curriculum should include the provision of early childhood exceptional education. There is need to infuse culturally relevant and culturally responsive curricula at the pre-service teacher preparation stage in order to produce ECD teachers who are self-sufficient and are able to improvise depending on the cultural context and socio-economic level that they find themselves in. A curriculum that teaches ECD teachers to improvise and make toys and other materials from locally available cheap materials would be more effective as this curriculum would teach ECD teacher candidates to use locally available materials to develop culturally relevant teaching materials. This takes into consideration the educational funding challenges that Zimbabwe is currently experiencing.

There is need for continuous ECD professional development through workshops to enhance the skills of those who are already working as temporary teachers without a relevant teaching qualification. These workshops should be geared towards teaching ECD teachers culturally relevant curriculum, child development, information on exceptionalities, early childhood teaching methods and strategies, early intervention assessment and skills, and development of partnerships with parents. This will help in providing quality to ECD programs especially those in rural areas and this benefits children with exceptionalities to receive appropriate education.

Policy makers and other stakeholders should be encouraged to work closely with non-governmental organizations (NGOs) as they can provide new opportunities for ECD. Most NGOs have new knowledge from working in other countries where they have established ECD. Policy makers and stakeholders should be willing to embrace new ideas, and adapt it to suite their own contexts. In most African countries they frown upon Western or European ideas saying they want homegrown ideas (Ebrahin, 2012; Nsamenang, 2007). Though this is understandable, the danger with this view is that, either some poor countries in Southern Africa do not have enough resources to conduct and develop effective research or it could be an issue of prioritization of available resources. It is encouraged to analyze trends in early childhood education globally (including efforts in other developing countries not only from Africa but Asia and The Pacific, Latin America, etc., to evaluate the possibility of importing culturally competent models. Adopting and importing what works for other countries is the beginning point and implementation should take into consideration cultural and geo-political differences and sensitivities. ECD teacher candidates should adapt to curriculum materials to suit different contexts. This emanates from the fact that within each African country, the cultures, and contexts are so diverse.

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References

Adams, J., Bartram, J., Chartier, Y., & Sims, J. (2009). *Water, sanitation and hygiene standards for schools in low-cost settings*. Geneva: World Health Organization (WHO). Retrieved from www.who.int/water_sanitation_health/publications/wash_standards_school.pdf.

Anderson, L. M., Shinn, C., Fullilove, M. T., Scrimshaw, S. C., Fielding, J. E., Normand, J., et al. (2003). The effectiveness of early childhood development programs: Asystematic review. *American Journal Preventive Medicine*, *24*(3), 32-46.

Bakken, L., Brown, N., & Downing, B. (2017). Early childhood education: The long-term benefits. *Journal of Research in Early Childhood Education*, *31*(2), 255-269.

Bloom, F. E., Nelson, C. A., & Lazerson, A. (2001). *Brain, mind, and behavior* (3rd. Ed.). New York: Worth.

Colbert, J. (2008). *Making a difference. Building emotional intelligence for lifetime*. Retrieved from http://www.earlychildhoodnews.com/earlychildhood/article_view.aspx?ArticleID=245.

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed). Upper Saddle River, NJ: Pearson Education, Inc.

Deiner, P. L. (2010). *Inclusive early childhood education: Development, resources and practice* (5th Ed.). Belmont: CA, Wadsworth, Cengage Learning.

Ebrahim, H. (2012). Tensions in incorporating global childhood with early childhood programs: The case of South Africa. *Australasian Journal of Early Childhood*, *37*(3), 80-86.

Eliason, C., & Jenkins, L. (2008*). A practical guide to early childhood education Curriculum* (9th Ed.). New Jersey: Pearson Education, Inc.

Fettig, A., & Ostrosky, M. M. (2011). Collaborating with parents in reducing children's challenging behaviors: Linking functional assessment to intervention. *Child Development Research. 2011*(2011). http://doi.org/10.1155/2011/835941

Freitas, L. B. L, Shelton, T. L., & Tudge, J. R. H. (2008). Connections of US and Brazilian early childhood care and education: A historical and comparative analysis. *International Journal of Behavioral Development*, *32*(2), 161-170.

Gallacher, K. K. (1997). Supervision, mentoring, and coaching: Methods for supporting personnel development. In P. J. Winton., J. A. McCollum & C. Catlett (Eds.), *Reforming personnel preparation in early intervention: Issues, models, and practical strategies* (pp. 191-213). Baltimore: Paul H. Brookes

Gallager, K. C. (2005). Brain research and early childhood development: A primer for developmentally appropriate practice. *Young Children*, *60*(4), 12-20.

Gargiulo, R. M., *&* Kilgo, J. (2011). *Young children with special needs: Birth through age eight*. Clifton Park, NY: Thomson/Delmar Learning.

Gargiulo, R. M., *&* Kilgo, J. (2020). (5th Ed). An introduction to *Young children with special needs: Birth through age eight.* Thousand Oaks, CA: SAGE.

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Gay, L., Mills, G., & Airasian, P. (2008). *Educational research: Competencies for analysis and application.* 9th Ed. Upper Saddle River: Prentice-Hall.

Gunhu, G.M., Mugweni, M. R., & Dhlomo, T. (2011). Integrating early childhood development (ECD) into mainstream primary school education Zimbabwe: Implications to water, sanitation and hygiene delivery. *Journal of African Studies and Development*, *3*(7), 135-143.

Harms, T., Clifford, R. M., & Cryer, D. (2015). *Early childhood environmental rating scale.* Amsterdam Ave, NY: Teacher College Press.

Henninger, M. L. (2009). *Teaching young children: An introduction* (5th Ed.). Boston, Pearson Education, Inc.

Kostelnik, M. J., Sodernam, A. K., & Whiren, A. P. (2011). *Best practices in early childhood education.* New Jersey: Upper Saddle River.

Macewan, A. (2015). Early childhood education, economic development, and the need for universal programs: With a focus on New England. *Economic, Management & Financial Markets, 10*(1), 11-47.

McDevitt, T., & Ormrod, J. (2016). *Child development and education* (6th Ed.). Boston: Pearson Publishing, Inc.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* CA, San Francisco: Jossey-Bass.

MOESC (2001). *Education for all: Towards 2015.* Harare, Zimbabwe: Government Printers.

Mushoriwa, T. D., & Muzembe, H. P. (2011). Attitudes of primary school teachers towards early childhood development in Zimbabwe primary schools. *International Journal Educational Studies*, *3*(2), 117-127.

Nsamenang, A. B. (2007). A critical peek at early childhood care and education in Africa. *Child Health and Education*, *1*(1), 1-12.

Nziramasanga, C. T. (1999). *Commission of inquiry into education and training*. Harare, Zimbawe: Ministry of Education, Sport and Culture.

Ramey, C. T., Campbell, F. A., Burchinal, M., Skinner, M. L., Gardner, D. M., & Ramey, S. L. (2000). Persistent effects of early childhood education on high-risk children and their mothers. *Applied Developmental Science*, *4*(1), 2-14.

Saracho, O. N., & Spodek, B. (2007). Early childhood teachers' preparation and the quality of program outcomes. *Early Child Development Care*, *177*(1), 71-91.

Sheridan, S. M., Edwards, C. P., Marvin, C. A., & Knoche, L. L. (2009). Professional development in early childhood programs: Process issues and research needs. *Early Education and Development*, *20*(3), 377-401.

Tashakkori, A. & Teddlie, C. (2003). *Handbook of mixed methods in social & behavioral research.* Thousand Oaks: Sage.

Tefera, B. (2018). Early childhood care and education (ECCE) in Ethiopia: Developments, research, and implications. *Eastern African Social Science Research Review*, *34*(1), 171-206.

The Southern and Eastern Africa Consortium for Monitoring Educational Quality (2017). *Zimbabwe education fact sheet*. Retrieved from http://www.sacmeq.org/?q=sacmeq-members/zimbabwe/education-fact-sheet.

Tierney, A. L., & Nelson, C. A. (2009). Brain development and the role of experience in the early years. *Zero to Three*, *30*(2), 9-13.

Turnbull, A., Turnbull R., Wehmeyer, M. L., & Shogren, K. A. (2013). Exceptional lives: Special education in today's schools (7th Ed). Upper Saddle River: Pearson.

_____

Turnbull, A., Turnbull, R., Wehmeyer, M. L., & Shogren, K. (2017*). Exceptional lives: Special education in today's schools* (9th Ed).Upper Saddle River, NJ: Merrill.

UNESCO (2008). *The contribution of early childhood education to a sustainable society.* Retrieved January 8, 2017, from http://unesdoc.unesco.org/images/0015/001593/159355e.pdf.

UNESCO (2015). A review of the literature: Early childhood care and education (ECCE) personnel in low – and middle – income countries. Retrieved 10 March 2018, from http://unesdoc.unesco.org/images/0023/002349/234988E.pdf.

UNICEF (2000). *We are also human beings: A guide to children's rights.* New York: UNICEF.

UNICEF (2002). *Child care practices in Zimbabwe: Harare, Zimbabwe*: UNICEF.

UNICEF (2014). *Early childhood development: Disabilities.* Retrieved from, http://www.unicef.org/disabilities/index_65317.html.

Welch-Ross, M., Wolf, A., Moorehouse, M., & Rathgeb, C. (2006). Improving connections between professional development research and early childhood policies. In M. Zaslow & I. Martinez-Beck (Eds.), *Critical issues in early childhood professional development* (pp. 369-394). Baltimore: Paul H. Brookes.

Women's University in Africa (2011). *Bachelor of education (Early Childhood Development).* Retrieved from, http://www.wua.ac.zw/index.php?option=com_content&view=article&id=17&Itemid=18.

Educational Environment – A Social Project of Support for the Social Development of a Roma Child

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Abstract

In the Bulgarian public space social distances and stereotypes regarding the Roma ethnicity are still difficult to overcome. This process' impact on the social development of the Roma child is an indisputable fact that has negative social implications when the child joins the school community. Predicting and overcoming these consequences implies conceptual researches amongst basic and innovative resources of teaching practice. The educational environment and its components have a social supporting effect in view of the permanent processes of social development of the child from the Roma ethnic group. There is no doubt that the teacher and the children from the class community have a stimulating role in this process.

Keywords: childhood, educational environment, social development, Roma child, educational process, pedagogical interactions, Roma community, social and cultural identity.

> "One looks back with appreciation to the brilliant teachers, but with gratitude to those who touched our human feelings."
>
> Carl Gustav Jung

1. Introduction

The challenges in the contemporary social situation, as well as the consequences of them, undoubtedly influence the phenomenon called "childhood", its characteristics, meaning and content. Nowadays childhood is a problematic area with inherent to its contradictions difficult to understand and solve not only by children but also by adults. In the scientific area, these stand out amongst them: difficulties in identification of the significant and necessary factors and conditions helping the actual child development, education and socialization; the occurrence of partial transformation of childhood at micro- and macro-social level; shortening the childhood period by including the child in adult activities; breaching the role of authentic factors from the close surrounding environment when "modelling" the childhood and determining the "steps" of its psychosocial development, etc. The occurred conflicts of course reflect on the subject of childhood, i.e. the modern child, the child of the 21st century who is often with its own vision and potential other from the adults' ideas (researchers, parents, and teachers) regarding their nature, individual

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features, opportunities for enrichment. The challenge in front of the social knowledge in this case is finding the child's process of social development and its dissociation from occasional, insignificant behavioral manifestations and interests that would rather be considered as a 'protest' against the unsatisfactory social environment.

As an addition to these contradictions and challenges in the public space, the prejudices, stereotypes, social exclusion, etc. related to ethnical groups are actively positioned. Their occurrence and existence creates a kind of algorithm of attitude and behavior towards "others", which in the childhood often places unstable grounds for the child's social development.

The opportunities for predicting and overcoming the challenges concerning the children society have a different vision. In general – the childhood phenomenon and the subject "child" in the 21st century need a new type of "reading" and a competent analysis. It is important that this "reading" allows the discovery of solutions that contribute to the actual social development of the child and overcomes the negative trends regarding the relationship between child and society.

A particular case of this problem is the question: *How does the Roma child fit into the contemporary social situation (in a national context) and what are the essential factors contributing to its current social development? The markers in this case also determine the purpose of the project – identifying the role of the educational environment in support of the process of social development of the Roma child.*

What requires our attention to be directed exactly towards the Roma child and the level of its social development? Few are the main accents:

- The social environment and way of life of a great part of Roma children (Bulgarian conditions) encapsulates them in the Roma community without the possibility of interactions in another wider social context.
- The specific social and cultural identity of the Roma community representatives and the living philosophy about their concepts for home and family; for education, which is not amongst their priority values; for the world of the child and that of adults who do not differ significantly; about the dreams of the Roma child; for the lack of innovative games and toys, etc. As a result, the so-called "modified childhood" is formed, which affects the level of social development and behavior of the child.
- The increasing unemployment in the Roma family, the non-speaking of the official language, the illiteracy in the community where the children live, the adoption of their own rules of living for the purpose of surviving, the existence of negative models of behavior of some of the subjects from the "closed" Roma community in which the child's personal and social development is not at a high level in the scale of values.
- The inclusion of children of Roma ethnicity in the so-called risk groups of children – they are "a particularly vulnerable group of children who need adequate help, support and care" (Krasteva, 2018). According to the author, there are number of measures, above all from the aspect of legal science, aimed at preventing the inclusion of Roma children in the "children at risk" group.
- The upbringing of Roma children in certain cases is carried out by members of the family due to absence of the parents – working abroad, which leads to the occurrence (in Bulgarian conditions) to the complicated social phenomenon – para-parental care (Kovachka, 2017) – an integral concept that "reflects the specifics of problems in upbringing and educating children with parent(s) – migrant workers".
- Neglectful attitude of the Roma community and hence of the child to educational and school reality, which deprives them of new types of experiences, new practical knowledge, new social practices and behavior patterns.
- Identification of the negative attitude of children in the classroom towards the different ones (children of different ethnicity, children with social or special needs)

and lack of fair assessment of their opportunities – a prerequisite for reduced self-confidence and aggressive protection.
- Difficulties of the Roma child when learning the educational content due to the low level of development of the cognitive processes and in this sense also lack of equal start, as well as equal chance for participation in the educational process, etc.

Within this background, the overall picture of the Roma child's childhood offers a series of situations, emotions and experiences, of adult problems and solutions, of "struggle" for status and social experimentation, of discoveries and steps for orientation in the complex social phenomena and relationships. A kind of social lifestyle of the Roma child, often with bad family environment on which the establishment of "self" depends, the dynamics of its individual development, personal and social perspectives, encounters with the world of known and unknown children and adults, of good and bad heroes, of the rights and duties of all people, of the relationships between them. Namely in the context of this summarized picture of childhood in the Roma community, the social development of the Roma child is directed as a dynamic and problematic, often with increased critical attitude and risk in terms of social behavior and adaptation to the surrounding world.

The concept of social development of the child in the age of childhood brings multilayer references. For Feldstein (1989), the main meaning of the child's social development lies in the appropriation of the social essence of man – from "self-perception, reflection, self-esteem and self-affirmation to self-consciousness, social responsibility, interiorization of social motives, need to realize one's own opportunities, subjective self-awareness as a member of society, to understand its place and purpose in it... The assumption of the social identity is a continuous process and at the same time a result of the child's social development in ontogeny". It is obvious that the question is about a complex process of balancing the child with the social system and developing its own individuality and socialness as a consequence of the influence of the social environment and its factors.

In its essence the child's social development is discussed as a goal, a process and a result. It is the required and socially significant component of the general child development, education and socialization. By itself, the level of social development of the child is recognized through the variety of its states, actions, qualities: social sense and social perceptions; social feelings, experiences and emotions; social behavior; Social status; social adaptability; key social competences; initiative; performance; organization; autonomy, etc. (according to Koleva, 2013). Each one of them is permanently being enriched on the one hand with the family conditions, and on the other – with the educational environment, in the scheme of the class community and the interactions with the coevals.

The family, the way of life in the community, the adults' attitude towards the Roma child, their priority activities, etc. are a significant factor for the social development of the Roma child. The picture in regards of the Roma family community is quite different - from the specifics of the traditional multi-child Roma family (including family members of different generations), through problematic anomie families (divorced, poor, unemployed, etc.), to families with successes in life (education, work, preserved values, etc.) (Nunev, 1998). The messages in this case explicitly contribute for the modeling of the vision and the conditions for social development of the Roma child.

2. The educational environment as a social project

The necessity of social development of the Roma child, adequate to the social circumstances and age characteristics, produced the requirement for updating the contents' and organizational resources of the so-called "school educational environment". It is part of the core of the entire pedagogical system and in it, and through it, the deep essence is being formed i.e. the

pedagogical interaction at level educator-child, educator-children, child-children. For the Roma child, the three forms of interaction are significant because they provide them with respect for their individuality and, on the other hand, enrich their social status and the opportunity to be included in the group of peers.

The modern vision of the school educational system has clearly defined parameters, above all due to their didactic and normative type. Priorities, principles and approaches, technologies, expected results typical for the education system are encoded in it. For the Roma child, however, some of them are the "other world" in which rules and norms of behavior act, other than the models and prescriptions they know. The Roma child's difficult orientation in the school environment is a prerequisite for a negative attitude towards it, lack of interest and motivation to participate in its activities, etc., which is essentially an indication of problems in the process of social development of the child. The consideration of this situation suggests construction of the educational space in a way that allows the Roma child to realize and accept its position as an important participant in it, to identify itself in the group of other people, to accept the educational and school way of life as needed and significant for it.

The orientation of the educational system towards support of the process of social development of the Roma child implies detailed development of its structure and clarification of the contents and meaning of each of its main components. In general it may be determined that they are composed in three stages (Koleva, 2013): ***first stage*** *– design of spatial (physical and subject) environment*; ***second stage*** *– an educational process – organized and regulated in class communities based on the age specifics of the children;* ***third stage*** *– processes of social interactions between the subjects involved in the educational environment – children and educators.* In fact, the components are conditionally differentiated – in essence, they are interrelated and it is important for them to be permanently improved in unity.

First stage *– "design" of the educational environment, i.e. in the organization and contents of the spatial (physical and subject) environment* or the vital space of the Roma child in the classroom should be considered, as far as possible, the specifics of its development, its interests and motivation for participation in the various activities. In this sense, actual are the ideas of Plackrose (1992): "children do need many and different conveniences. They need space where they may do their "dirty" job as painting and modeling, a place where they may quietly work with paper, pencil and a book, of a separate place where they could discuss with their teacher individual matters, of a place where they can make some noise (for music and dramatization) and of a place where an absolute silence is needed (for recording)". And more, according to Dinchiyska (2005) – "the contemporary understanding of a spatial environment is that it is not an elementary physical category; it is not just a living environment in which the children reside during a certain period of time. It is a cultural and pedagogical complex in which children and their teachers live and work." The spatial environment should be considered as a "pedagogical composition" with an opportunity to stimulate the activity of the children and with the messages suggested by Jones (1995), such as: "It's good to be here", "Here is your place", "A place you can trust", "It's the right place to try and explore your ideas", "You can be secluded whenever you want", and so on.

In fact, the overall positive thesis related to the spatial organization of the educational environment in the school aims at overcoming the "closed" spatial solutions and giving priority to the so-called "open" solutions (Plackrose, 1992). The interactions between children and, in this sense, the change in their social position in the classroom is an opportunity for "facilitated communication", which is the basic, universal feature of any educational environment. And another thing in this sense: "And the walls themselves. Are they used to show children's works? Are they arranged attractively? Does what they show encourage us to enter the room, to look around, to learn? Does the information displayed on them (drawings, photos ... panels) prompt us to find out more about the subject" (Plackrose, 1992). This emotional picture of the classroom is especially suitable for the Roma child; it is in the context of its spontaneous emotionality and, at

the same time, an opportunity for easy control of social experience. It provides a variety of contacts with children, acquiring skills for coordination of their social and cognitive experience with that of other children; common experiences and solutions occur.

Second stage *– educational process – organized and regulated in class communities based on the children's age specifics and on their cognitive and social development.* In general, this process is legitimized through educational documentation, including the cognitive content, goals, tasks and activities, pedagogical teaching and learning approaches. By content, all of them are oriented towards developing the child's cognitive potential and towards its permanent enrichment by including in the process of learning verbal and practical expression and achievement of expected results i.e. the educational minimum and development of the child's intellect. Here especially significant in terms of this work are the questions: *May the educational process be seen as a social project that takes into account the social and cultural priorities of the Roma child? Are the cognitive contents and cognitive actions – literacy, mastery of elementary mathematical actions, narrative and meaningful understanding of the texts sufficiently accessible for understanding by the Roma child?* Because, as written by Dzhorova (2003), "the attitude of the Roma child towards school depends on the degree of success in the fulfilment of the school duties and their adequate assessment. The bigger the success is and the more assessed it is, the more positive and responsible the attitude towards school activities is." It is a fact that exactly the social outline of the educational process, the one that supports and stimulates the positive feeling of success or "victory over complex tasks" is the reality that the Roma child needs. The social messages of the educational process are of great importance for it – it participates, shows interest, seeks for support, enjoys the success of others, etc. Obstacles related to learning are overcome, the positioning of the Roma child in the classroom is balanced.

The careful planning of the educational process and its individualization from the aspect of the opportunities of the Roma child place practices with significant influence on the process of its social development. Social competences and problem-solving skills are mastered; acts of initiative, independence, diligence, undertaking more responsibility for their own learning are registered. A developing effect has an educational process in which the Roma child is a main personage participating in the situation of "learning", i.e. it is presented by the teacher as initiator of activities in the educational environment which in its turn reflects on his/her needs, interests and motivation for learning.

The socio-cultural orientation of the educational content, the interpretation of texts related to the life and the social environment, meaningful and familiar to her/him, the discussion of problems with references to the Roma community is essential for the social development of the Roma child. The didactic principles "from familiar to unfamiliar, from close to distant" in this case are essential for the inclusion of the Roma child in the learning process, for the understanding of the lessons taught, for the development of cognitive interests, for mastering observation, analysis and summary skills. Thus, on the basis of an ensured opportunity for work at its own level and a manifestation of mastered cognitive experience, the Roma child starts his "path" to knowledge and to the awareness of his social significance.

The motivation and active participation of the Roma child in the educational process are definitely depending on the presence of "rich" educational environment. Textbooks, teaching notebooks, didactic materials, materials for various individual and group activities, various information products, positive design of the classroom etc. – these are just some of the components of the educational environment necessary for the inclusion of the Roma child. It is the "rich" educational environment with its variety of supplementary means that can provide the Roma children with the opportunity to master basic cognitive actions and operations – analysis and synthesis, comparison, analogy, research, search for solution options, team participations, control of decisions, understanding the meaning of assignments, etc. Within the meaning of these processes it is important "hard" mechanisms or algorithms to be adopted for solving the diversity

of school tasks and situations. The use of well-known schemes for understanding and performance of cognitive actions and operations in the course of the cognitive process, shortens the process of "searching and finding" solutions, which, for the Roma child is an opportunity for almost smooth achievement of the expected result.

In the classroom deliberately created social situations can be offered, adequate solutions to be sought, and the Roma child to be stimulated to discover and realize the possible and desirable social perspectives in front of him/her. Opportunities for positive results offer techniques such as: evidential technologies, social experimenting, role-playing, learning, focused on solutions, team activities and so on. The Roma child's orientation and research activity stimulated through such techniques allows occurrence of targeting, testing a certain type of behavior, mastering new effective forms and ways of communicating with adults and peers.

Third stage – *process of social interactions between those included in the educational environment – children and educators.* Namely the latter shape the "image of the educational environment" and help it to be presented as a social project and to be operationalized as a humanistic, developing, harmonious, and interactive. *What is the informal position of the Roma child amongst its peers in the classroom, considering that it is mostly with a lower social status and does not have a high level of sociality compared to other children in the classroom?*

In its essence, the question first focuses on the specifics of the class community or child society in which the Roma child should be involved. The children in the classroom form the vision of the kids' society that functions on the grounds of clear algorithms for communication and adopted by them rules, regulations, rights, and obligations. Namely the position, the models of behavior, the particular kids' qualities and their diversity in the context of the common climate of interactions are in the base of the development of sociality and the social development of any child. Their level allows any child to fit into the socio-cultural context of the class without any problems. In this sense the significance of social development of the Roma child – the level and variety of mastered by its social skills and methods for interaction with others is an essential inclusion factor. Any subsequent step towards enrichment of the class community's sociality reflects over the relations between children – they change towards tolerance, goodwill, mutual assistance, agreement, and joint action to achieve results. And this allows the Roma child to successfully participate in various activities and from different positions – performer, initiator, partner, assistant, self-solving tasks, evaluating and self-assessing, etc. The consequences are also related to the opportunities for socio-cultural identification of the Roma child.

The main subject regulating the interactions in the classroom is the educator. It is quite obvious that he may model and improve all components of the educational environment. The teacher's professional competences (European qualification framework for lifelong learning, 2005) suggest specialized psychological and pedagogic knowledge about the child, successful management of the pedagogic resources, personal qualities and values. These are the prerequisite for the creation of a "social project" for the Roma child that will permanently update the process of its social development with reflection on the inclusion, the sense of community, the understanding of the positive messages of the school environment and the prospect of inclusion. In essence, the social project requires the teacher to "step-by-step" to "recognize" the Roma child, to create conditions meeting his or her potential and needs, to "provide" a formal and informal learning environment for active and positive behavior. The question is about steps that require the teacher to prepare, plan, organize, and carry out a series of actions using diverse and individualized methods, tools and techniques in the course of pedagogical interaction.

It is imperative that the steps of the teacher are aimed at getting to know the strengths and weaknesses and specifics of the Roma child, the positives and negatives of the environment in which he/she lives, the specificity of ethnical and cultural identification, desires, interests and claims, attitude to the school environment. This will enable him to shape the "real" vision for the

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Roma child and define the parameters of his positive strategy for working with him, the realization of which will allow for acceptable social and learning outcomes. Creating a positive emotional environment and a climate of trust (by M. Montessori) on the basis of informal social interactions between the teacher and the Roma child in general leads to a change of its attitude towards the environment and provides criteria for assessing what is true and what is wrong, what is good and what is bad, what is beautiful and what is ugly, etc. And this of course reflects on the possibility of overcoming the "school disadaptation" (according to Shosheva, 2008). In a detailed plan, it is important for the teacher to work for Roma children to understand the messages of the school environment and the class community – why we need to be in school, pleasant and unpleasant activities, we accept and respect the differences, here it is safe and peaceful, learning is a pleasant activity, assistance, cooperation and friendships are very important, participation in class activities has a perspective sense of self development and future realization, etc.

Significant for the social development of the Roma child are also extra-curricular activities and informal relations in the educational environment. It is true that today's Bulgarian school almost does not position its commitments and influence on the daily life of the Roma child outside the classroom and does not offer a variety of programs for unintentional interactions of professional educators with it. However, also true is the trend, according to which the social expectations and mission, objectives and tasks of the Bulgarian school are changing permanently and at the same time dynamically. The specificity of the educational situation in the Roma community adds further details to the emerging trend. In this context, the pedagogical community should also be focused on initiating a variety of extracurricular activities and informal communication with the Roma child. The participation of children in projects outside the classroom – sports activities, entertainment programs, activities chosen by them, creative activities, work activities, historical or geographic tours, volunteer squads, "desegregation projects" – all of these are part of the prerequisites for achieving positive informal relationships between peers of different ethnic backgrounds, teachers and parents.

3. Conclusions

Researchers of the "childhood" phenomenon take into account the impact of "social changes" on the reality of "childhood" as well as on the social practices of each child. Discussed as "complex social formation and structural element of the society" (according to Shteglova, 2003), it is important to be taken into consideration "the different faces of the contemporary interpretation of childhood" (according to Chavdarova-Kostova, 2018). More priority have the accents which direct us to the fact that the childhood nowadays should be "discusses as a period in which the society, in broad terms, and the family in a narrower context, implements a process of investment in child in view of its future social, incl. economic prosperity" (Chavdarova-Kostova, 2018). It is about investment in human capital, even though, as Krastev (2018) writes "the investments made for increasing human capital not always result in increasing his potential, because this depends, first of all, on providing suitable environment for its realization". And what is the educational environment that is provided to Roma children and are the investments made in it the key to solving the issues related to their social development and active inclusion in the educational system?

Unfortunately, our national educational legislation still does not prioritize the educational environment, does not recognize it as a social project with serious functions in terms of children's development, notwithstanding their ethnicity, religion, gender, social status, the investments are still insufficient, etc. And most importantly, the provocations and requirements typical for the new socio-cultural and educational situation in the modern 21st century with respect to the life and development of the child are not taken into account.

On its part, the educational environment should work to overcome stereotypes and prejudices, as well as to sustain the understanding that "education is one of the main means at its disposal to solve, though difficult, the problems. The argument "education" suggests serious educational resources which generally envisages not only political solutions, but also legal, economic, social and cultural ones" (Krastev & Krasteva, 2016).

The above listed trends, which are directly related to the process of globalization, seem to be far from the Roma community's ideas about the development of their own children. In the spirit of humanistic attitude towards children, as well as their social development, this community "must properly "read" the messages of time and find the right path" to support the development, education and socialization of its adolescent representatives.

Undoubtedly, the childhood of a Roma child is an almost unmanageable "grey-and-white" social situation for which pedagogical science does not yet have reliable tools for interaction and, above all, for stimulating its social development.

The reliable positions in this direction are identified as:

• Design and operationalization of a national educational project based on the understanding that the educational environment at school should also be seen as a social project with commitments to the social and personal development of each child.
• Inclusion of Roma child in the educational environment and providing opportunities for communication with peers seen as a chance for its current social development and change of social status in the children's community;
• Active learning of the official Bulgarian language by the Roma child and his / her family for a successful social orientation in social paradigms and inclusion in the process of school education;
• Specialized intercultural teacher training for work with the Roma child – acquainting with the values, traditions, language and religion of the Roma community, mastering skills for performing mediatory functions in order to overcome social distances and ethnic stereotypes, acquainting with the specifics of ethnic identification, and so on;
• Professional psychological and pedagogical teacher training oriented towards finding the specific individuality and sociality of Roma child and provision of conditions for their harmonization by means of the educational environment's components;
• Systematic and contemporary enrichment of the school educational environment in both directions – as a prerequisite for the development of the Roma child's social potential and as a significant condition for the change of the social context of the class community. It is the social context, encoded in the sense of the educational activities that will assist the Roma child in the course of the most useful adaptation and integration in the public space.

References

Chavdarova-Kostova, S. (2018). Contemporary interpretation of childhood. In *The child and pedagogy, Anniversary collection*. Sofia.

Delcheva, T., Dinchiyska, St. et al. (2005). *Technology of pedagogical interaction in situations*. Burgas: Annex Consult.

Feldstein, D. I. (1989). *Psychology of personality development in ontogenesis*. Moscow.

Jones, E. (1995). *Adult education*. Sofia.

Kovachka, Yu. (2017). *Social and pedagogical problems in children with para-parental care*. Blagoevgrad: University publishing house "Neofit Rilski".

Koleva, M., (2013). *Child's social development and education. Identification. Stimulation. Diagnosis*. Blagoevgrad: University publishing house "Neofit Rilski".

Krushovska (Dzhorova), Bl. (2003). Dynamics in the Roma child's attitude towards school. In *The educational situation in the Roma community. Regional researches*. Blagoevgrad: University publishing house "Neofit Rilski".

Krasteva N. (2018). *Children's legal protection*. Sofia: "Veda Slovesna" – Zh. G.

Krastev, V., & Krasteva, N. (2016). Integration of people with refugee or humanitarian status in Bulgaria through education. In *Migration processes' impact on geopolitics, economy and public sphere. Conference textbook*. Blagoevgrad: University publishing house "Neofit Rilski".

Krastev, V. (2018). The conflict of interest and human capital. In *Development of the human potential for innovative social and cultural environment*. Blagoevgrad: University publishing house "Neofit Rilski".

Nunev, Y. (1998). *Roma child and its educational environment*. Sofia.

Opravilova, E. (1993). *Questions about pre-school education. Compass*. Foreign pedagogical publications. No. 3-4. S.

Part of the European qualification framework for lifelong learning (2005). Commission of the European communities. Commission working document. Brussels, 8 July 2005. SEC 957.

Plackrose, H. (1992). *The school as a place for children*. Sofia: International education and research center.

Shalaeva, S. L. (2007). The world of childhood and the world of adults: the new real relationships. *Psychologist's Journal*. Translated by Sn. Ilieva and R. Stamatov, Moscow.

Shosheva, V. (2008). *Education and socialization of mentally retarded students*. Stara Zagora.

Shteglova, S. N. (2003) Childhood sociology. As an optional course. Teaching experience. *Sociology Research*, 6, Moscow.

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