Rediscovering Problem Solving In The Early Childhood Curriculum
Heather Bridge

ABSTRACT

Questionnaire responses suggest although educators know the learning value of problem solving, they rarely use it. Twenty-one educators were introduced to learning through problem solving. They were read a story and asked to overcome an associated problem. The questionnaire assessed children's literacy learning through problem solving, and educators' frequency of using it. Educators recognized that learning was stimulated. However, few of them regularly used it. Reported reasons for this were organizational problems and pressure of State Learning Standards. To increase problem solving, it is recommended educators attend professional development workshops that focus on learning theory, problem-solving activity and meeting State Learning Standards.

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Introduction

Problem solving is recognized as a valuable teaching and learning strategy that can be used with children of all ages and across content areas in the elementary curriculum (Krulik,1998; Williams & Hmelo,1998). This paper is primarily aimed at early childhood educators, who as they observe young children, are likely to see examples of their problem-solving ability. Many children between the ages of 3 and 8 years are able to solve complex problems in play. In this paper, the results of a questionnaire given to a group of early childhood educators about the use of story to promote problem-solving activities for children are presented. The results suggested that even when educators knew of the value of problem solving activity, few used it regularly. The reasons appeared to be related to their initial training that affected their perceptions of children's problem solving ability; organizational difficulties in their settings; lack of time; insufficient resources; safety issues, and the perceived pressure of State Learning Standards.

Definition of problem solving activities

Problem-solving activity is defined by Catherwood (1995) as: "Using cognitive processes to combine or associate information towards the achievement of some goal or solution to a problem, as in logical deduction, or finding a novel solution to a problem, as in reasoning or thought" (p.40). In this paper, problem-solving activity is reading a problem-based story to a group of early childhood educators and asking them to work out ways to solve the problem in the story. The story that was read to the educators and the associated activity that they attempted could be carried out with children aged 4 to 5 years. Story telling is only one of many possible ways to create problem-solving activities in the early childhood curriculum.

The literature on children's problem solving

One underlying learning theory has suggested to educators that children's problem-solving abilities are affected by context, language and socialization. Vygotsky's (1978) theory of social constructivism has influenced the ways in which early childhood educators understand how context has an impact on young children's problem-solving ability and on their own teaching. Vygotsky viewed children's problem solving as a social and emotional activity that best took place through interaction with peers and educators. Vygotsky's concept of a Zone of Proximal Development drew attention to the importance of maximizing children's problem-solving ability by aiming not at what they do alone but by what they can do with the assistance of others. However, if the quality of social interaction in early childhood settings is central to young children's effective problem solving, then the nature of that social interaction has to be made explicit. Bruner (1980) suggested that educators interact with children by scaffolding their activity so that supplementing, orchestrating and highlighting critical features help children to achieve what they otherwise would not be able to do. Such scaffolding is dependent upon educators modeling desired actions and high quality conversations between children and educators, which do not occur as often as they should.

Rogoff & Watsch (1984) further developed Vygotsky's theory of social constructivism by emphasizing not only the social but also the cultural dimension of children's problem-solving ability. She suggested that through "guided participation" with educators and peers, children are more able to engage in problem solving. The impact of culture on children's learning is evident. However, in order for early childhood educators to best understand how culture can affect children's problem-solving ability, it is necessary for them to regularly communicate with children's families. As increasing numbers of young children's family members work, the opportunities for educators to have regular and direct contact with them is reduced.

Paley (1990) extended educators' understanding of the theory of social constructivism in the early childhood curriculum. She observed how young children attempted to solve real classroom problems in their socio-dramatic fantasy play. Paley observed a problem concerning children not clearing up after their play. When Paley discussed the problem with the children, they suggested that tunnels and trap doors would catch those children who tried to avoid clearing up. Although Paley tried to bring the children and the problem back to reality, they persisted in their perception of the problem and of the solution. Paley's observation demonstrates how young children's problem solving, social construction, fantasy play and perception is connected and therefore has important implications for the ways in which children learn. However, opportunities for play-based intellectual development could currently be at risk, in early childhood settings where demonstrated learning outcomes for even the youngest children are now demanded.

Problem solving is known to be a successful teaching and learning approach throughout the early childhood curriculum. Conezio and French (2002) described how social interaction during small-group science investigations stimulated children's questioning and language development. The science investigations enabled children to overcome real problems that were relevant to their everyday experiences. Although such problem-solving activities offer children challenging learning opportunities, the effectiveness of them depends upon early childhood educators who have sound scientific knowledge themselves. It is reported that many early childhood educators who also are predominantly women, are not confident in their scientific knowledge (Browne & Ross, 1991). As a result, they may be reluctant to teach science or use science-based problem solving strategies in the early childhood curriculum. However, not all problem-solving activities need be science-based. Problem solving also includes a

creative element both in the ways teachers plan such activity and in the ways children respond to it. This creativity enables educators and children to use their imagination in the early childhood curriculum. Cooper and Denver (2001) reported how socio-dramatic play that involved children creating a card shop presented them with problem-solving opportunities for card design, composing messages and devising displays that supported their general literacy skills, especially their emergent reading and writing. Neeley (2001) explained how music times presented children with problem-solving opportunities to make up their own music and have "musical conversations" that supported their listening, musical composition skills and language development.

Isenberg and Jalongo (2000) stated that teaching young children through problem-solving activity is a highly skilled and creative process. They cited four criteria for effective problem-solving activity in the early childhood curriculum: (1) the activity must allow children's self-expression; (2) the problem must be relevant to children's interests; (3) educators have to be open to children's ideas, and; (4) educators have to allow non-traditional approaches to problem solving. These criteria suggest that educators should work permissively with children during problem-solving activities, enabling them to think up their own original and diverse solutions. Although such permissive approaches may be best for children's learning, they can require that educators relinquish their control over children's learning because they will not know the outcomes ahead of time. Although an open-ended approach to children's problem-solving is likely to have support among those early childhood educators who use "developmentally appropriate" practices, it may be under threat because of State Learning Standards that call for more exact and measurable learning outcomes.

The Conference

This paper is based on a workshop presented at a National Association for the Education of Young Children (NAEYC) conference. The theme of the conference was: *"Children and Creativity"* and was aimed at increasing early childhood educators' awareness of children's creativity in the early childhood curriculum, particularly at a time when more formal academic learning is often emphasized. The educators worked in a variety of private, community, state and federal settings in a local city and in neighboring rural counties. The workshop had two aims: (1) to enable early childhood educators to participate in a story-based problem-solving activity, and, (2) to ask the educators to complete a questionnaire about using problem-solving activities in their settings.

Survey of Early Childhood Educators

The Pre-school Educators

Twenty-one female early childhood educators attended the workshop. Their questionnaire responses revealed that they had worked in settings for varying lengths of time: under 1 year (4); 2-5 years (7); 6-10 years (8); 11-15 years (2). The educators held a variety of qualifications for their jobs as educators that included: high school diploma (10); associates degree (6); associates degree in early childhood education (3); bachelor's degree (1); bachelor's degree in early childhood education (1). Around 50% of educators had not gone on to higher education nor had they received training that was specific to early childhood education. The other 50% had received higher education. Only about 25% of all educators had early childhood qualifications. This data suggested that few of the early childhood educators were specifically trained for the age range with which they worked. The educators worked in a number of different positions in early childhood settings: teacher (4); assistant teacher (5); classroom aide

(9); carer (3). The more highly qualified educators, including those specifically trained in early childhood education, had teacher roles. Conversely, unqualified educators were more likely to work as aides or as carers in early childhood settings.

The educators worked in a variety of early childhood settings: day care (2); preschool (6); private kindergarten (1); pre-k (7); nursery school (2); home (3). All these settings cared for children between the ages of 3 and 5 years. Some early childhood settings provided full-day care whereas others provided half-day care. The settings were funded in different ways: through fees; federal; State and "not for profit" funding. The more highly qualified educators tended to work with 4 year-old children in State funded pre-k programs, whereas less-qualified educators tended to work with younger children in private and federal programs.

Research approach

In view of the literature review findings that suggested that problem-solving activity was an effective way to support young children's learning, the aim of this study was to carry out an exploratory study that gathered the responses from a small group of early childhood educators about their use of problem-solving activity in their settings.

The educators listened to the problem-based story *"The Lighthouse Keeper's Lunch"* by Rhonda and David Armitage. Mr Grinling, the lighthouse keeper, faced a problem. Each lunch time, Mr Grinling waited for his lunch-basket to arrive. But as the lunch basket came across on a wire from his cottage to the lighthouse, seagulls descended on it. When Mr Grinling got the lunch basket, the food had been eaten by seagulls. Mr Grinling wracked his brains for ideas that would prevent the seagulls from eating his lunch.

The problem-solving activity

The educators were asked to work in groups of 4 or 5 to think up ways to solve the problem in the story. The groups of educators used a range of materials to prepare lunch baskets and make them seagull-proof. Upon completion of the problem-solving activity, the educators placed their problem-solving artifacts on a diorama that was set up in the workshop room. The artifacts included: a lunch basket with a fishbowl placed on top of it so that the seagulls could eat the fish instead of the lunchbox; a lunchbox that was disguised as a seagull; a lunchbox with spikes sticking out over it preventing the seagulls from landing on it; a lunchbox covered in tin foil that reflected the sun into the seagulls' eyes to prevent them from seeing properly; and, a lunchbox that had a cat sitting in an attached basket that would frighten them away. The diorama was created so that the different artifacts could be compared by educators and considered for implications on teaching.

Results of the Questionnaire: educators views of story-based problem solving activity

All twenty-one educators said they would be prepared to a use story to promote children's problem solving in their classrooms. The educators mentioned many ways that story-based problem solving could promote early childhood children's learning:

1. Stimulation of children's cognitive development. Educators said that children would have to understand the story in order to decide what a deterrent is. Children would have to consider cause and effect to plan for a deterrent that worked. They could solve problems by drawing on their own knowledge of deterrents, but they could also think up fantasy ideas. Educators thought that children would have to make decisions about the use of materials they would need for the

deterrent. The activity encouraged children to be divergent thinkers, brainstorming as many possible solutions could work. They would have to reason and predict what might happen based on their understanding of the problem. Educators thought that problem solving would encourage children's concentration and persistence.

2. Promotion of children's social development. Educators said that the problem-solving activity would enable children to have extended interaction in groups. They thought that when children worked together opportunity existed for them to hear each other's ideas and to have a group identity. By having to work cooperatively in groups and share materials, children would learn to compromise.

3. Provision for children's emotional development. Children would be able to feel confident about their input to the group. Educators liked how children's self-expression would be fostered, and they mentioned the importance of honoring children's independence during activities.

4. Support for children's language development. Educators thought that problem-solving activities would give rise to "quality talk" amongst children. Such talk included children asking questions and expressing ideas to overcome the problem. The opportunity for children to listen to each other would be crucial to the development of language and comprehension. This was seen as particularly valuable for children with delayed language and for those who spoke English as a second language.

5. Development of children's creativity. Their imaginations would be fired by the story and by having a choice of materials to choose to work with. Children working in a group would have the opportunity to invent something as a group effort. Educators thought that a "hands-on" experimental approach would enable children to predict how well their solution worked.

6. Development of children's physical skills. As children manipulated materials and tools, educators thought that their fine motor skills would be developed.

Results of the questionnaire: educators' roles

When asked what part educators played in story-based problem-solving activities, they identified a number of professional roles including supporters, talkers, assessors, and supervisors. These roles are described in more detail below.

1. Supporter of children's learning was thought most important. This took the form of re-reading the story to children, being participants in groups, providing encouragement and guidance to children, and providing resources. Although educators saw themselves as part of the group, they did not see themselves actually doing the activity with children.

2. Talkers. The educators said they would ask children to explain what they were doing in the activity and how they were solving the problem. The asking of "open-ended" questions that invited children to respond in many possible ways was seen as important.

3. Assessors. Some educators said that they would observe children during the activity. They would evaluate how well they perceived and responded to the problem. They also said they would listen to children as evidence of their thinking during the problem-solving activity.

4. <u>Supervisor.</u> A small number of educators saw their role as supervisor, when they would be directing children's behavior. Educators did not identify a traditional teaching role such as instructing or leading the activity.

Results of the questionnaire: frequency of problem-solving activity

The educators were asked how often they organized problem-solving activities in their settings. They chose from three possible alternatives: often - once a month; occasionally - once a semester, and; rarely - once a year. Although all the educators had said that they would be willing to use problem-solving activities in their classrooms, few in the sample regularly did. It is possible, but unlikely that the educators were unfamiliar with problem-solving activities.

There was a relationship between the training of the educators and their frequency of using problem-solving activity. The four educators who used problem-solving activities often (not necessarily always story-based) were the one teacher with a bachelor's degree in early childhood education and the three assistant teachers with associate degrees in early childhood education. Two of these educators had worked in early childhood education for 11-15 years and the other two had worked between 2-5 years. From these findings, early childhood educators' early childhood training and what type of setting they worked in appeared to be factors that may explain their frequent use of problem-solving activities in their settings. The length of time they worked in settings may also be important but not as influential as their training. However, further research would be required to validate these claims. Three of these educators worked in State funded Pre-K classrooms and one was an assistant teacher in a nursery school. Early childhood educators who used problem-solving activities frequently were all specifically trained in early childhood education and all but one of them worked in state funded Pre-K classrooms with 4 year-old children where State Early Literacy standards were included in the curriculum.

The seven educators who said they used problem-solving activities occasionally tended to have higher educational qualifications, but were not in early childhood education (in subjects, such as mathematics, psychology and criminology.) These educators worked as teacher, assistant teachers and carers in a variety of privately funded settings. This suggests that these educators may not have had the specific early childhood education training necessary to understand how early childhood children best learn. As a result, their teaching approaches may have been restricted.

Around half of educators rarely used problem-solving activities. These educators had more modest educational qualifications and tended not to go on to higher education. Their qualifications were not specific to early childhood education, suggesting that they were not specifically trained for the job they did. Many of them had worked in early childhood settings between 6 to 10 years suggesting that they were experienced educators, but not well trained. These educators worked as classroom aides and assistant teachers in all types of early childhood settings. They often worked in classrooms with 3 year-old children. The reasons why educators organized problem-solving activities with the frequency they did are described below.

Educators who used problem-solving activities "often"

All the educators who used problem-solving activities "often" thought that it was a beneficial learning strategy for all children, irrespective of ability. They all commented that problem-solving activities encouraged children's free-thinking and decision making in play. Some made the point that pictures in the book, rather than the words of the story would help children understand the problem more clearly and think up solutions (Newton, 1994). One felt that children's concentration was developed by

these activities. These educators thought the early childhood curriculum was enriched and made more challenging through problem-solving activities. Some of these educators mentioned that problem-solving activities created good opportunities for child observation and assessment. These educators did not always use a story as a starting point for problem-solving activities but instead used socio-dramatic play and the acting out of conflict resolution.

Occasional users

The educators who said that they used problem-solving activities occasionally thought that, although it was a valuable approach to children's learning, not all children were able to attempt it. Some of these educators said that they considered supporting children's problem solving in their own free-play to be more appropriate than problem-solving activities that were planned by educators. Others thought that some children were too young or inexperienced to understand problem solving, and were not able to come up with solutions of their own. Another factor that was mentioned by many of the "occasional" users was that problem-solving activities were unrelated to Early Literacy State Learning Standards. These educators felt under pressure to concentrate more on structured literacy activities, in the form of phonics and alphabet recognition that they thought prepared children for Pre-Kindergarten and Kindergarten classes. Although the "occasional" users saw reading stories as very important to the development of children's literacy, they did not see using stories to stimulate children's problem-solving skills as part of that literacy development. It appeared that the occasional users who did not have specific early childhood training may not have had sufficient professional understanding of the Early Literacy State Standards and how they can be used appropriately in early childhood settings.

Rare Users

All the educators who rarely used problem-solving activities recognized its learning potential, but they did not organize such activity because it required too much preparation time on top of what they already had to do. The lack of long, unbroken blocks of time during early childhood sessions was identified as another constraint. Many thought that children's restless behavior and poor concentration were reasons for not using problem-solving activities. Others were concerned about safety issues regarding children's handling of tools and materials. They said that scarce materials made it difficult to work in this way. Many of these educators also said that they felt academics, particularly "reading" to be more important in the early childhood curriculum. They also mentioned getting children ready for Kindergarten by taking account of State Learning Standards for literacy even though they did not have to. Again, inadequate early childhood training may account for the educators' lack of professional understanding about how State Literacy Learning Standards can be used in ways that benefit children's literacy development.

Discussion

Limitations

Although this exploratory study presented a picture of a group of early childhood educators' problem solving practices, care must be taken in the interpretation of the findings. On account of its design, the study had limitations because of the small number of early childhood educators who participated and because only one of them was a certified early childhood teacher. The findings could be quite different if the study included a larger and more highly qualified group of early childhood educators.

Also, the study took place in one city in a rural area of New York State and findings represent this particular group in this area at this time. Findings could be very different in other locations. Although the study revealed some useful insights into the thinking and practices of a group of early childhood educators, generalizations about early childhood educators and their practices must not be made from this study.

Educators' perceptions about the early childhood curriculum

All the early childhood educators in the study were aware of the value of problem-solving activities for children's development and learning. With some reservations, the educators approved of the materials and tools that children would handle during this activity. They were clear about their own roles in the activity. Despite these positive attitudes, most educators did not often use story-based, problem-solving activities in their settings, although it is possible that they may have used other forms of problem-solving activities. This suggested that although some early childhood educators knew problem solving to be beneficial for children's learning, they did not use it in their practice. One reason for this appeared to be connected to some early childhood educators' initial training (Spodek & Saracho, 1990). Those educators with early childhood training appeared confident about using problem-solving activities more often than those educators who were less specifically trained in early childhood education. In contrast, the educators whose initial training was not in early childhood education used problem-solving activities only occasionally. They tended to view children in more negative ways, emphasizing what they could not do. These educators' perceptions may change if they were to model successful problem-solving strategies to children and support their growth within the Zone of Proximal Development.

Promoting Problem solving in Early Childhood Education

Both structured and unstructured problem-solving activities can effectively support young children's all-round development, including their literacy development. The opportunities that young children have to support their early literacy development are known to have important implications for their later literacy development (Pelligrini & Galda, 1982; Jacob, 1984; Morrow, O'Connor, & Smith, 1990; Morrow & Rand, 1991; Pelligrini & Galda, 1993; Christie, 1994). Publications can help early childhood educators plan successful problem-solving activity in their classrooms (Katz & Chard, 1989; Britz & Richard, 1992; Isenberg, & Jalonga, 2001.) These writers encourage early childhood educators to develop positive dispositions towards children's problem-solving abilities and perceive them as capable problem solvers. For instance, educators can develop a "critical stance" in their teaching so that they intentionally plan for problem solving in their classrooms. They can recognize suitable scenarios and know how to turn them into problem-solving activities for children. Also, educators can plan for problem-based conversations so that children regularly pose investigative questions and state their opinions. Children's own ideas can be incorporated into problem-solving activity so that purpose is shared and made meaningful to them. Children also can solve problems in their own ways and at a variety of levels to reflect diversity in their thinking. A workshop environment that enables children to successfully attempt problem-solving activity can be created in settings. In addition, a relaxed approach to time management is recommended so that children have large blocks of time that enable them to play and continue working on their problem-solving strategies from day to day. The workshop environment can allow children adequate space to play out and create their problem-solving strategies. Adequate space for them to work on the floor and to store their problem solving artifacts is important. The workshop environment thereby provides children with a wide range of open-ended materials that enable them to represent their unique

ideas. Materials and tools should be clean, safe, accessible and in sufficient quantity. Children should be able to move and combine materials in ways that fulfill their problem-solving purposes.

Using Children's Literature for Problem Solving

Children's literature can be used as an effective starting point for problem-solving activity by both educators and children. Nursery rhymes and traditional fairy tales can create good problem-solving activity for young children. Educators can refer to the Miami University Digital Resource: Children's Picture Book Database at www.lib.muohio.edu for children's literature that lends itself to viable problem-solving activity. In addition, the story by Pfister (2000) *The Rainbow Fish* enables children to suggest ways the loveliest but loneliest fish in the ocean can make friends. Armitage (1998) *The Lighthouse Keeper's Catastrophe* gives children the opportunity to devise ways to recover a lost key. Butterworth's (2003) *After the Storm* enables children to create new homes for animals that were destroyed in a storm. Oran and Partis (2003) in *The Good Mood Hunt* give children the chance to collect items that put them in good moods to create a perfect day. Such books enable educators to create problem-solving activity that is developmentally appropriate for young children (Cline, 2001), benefits their literacy development (Steinberg, 2001), and effectively supports New York State English Language Arts Standard 3: Students will read, write, speak and listen for critical analysis and evaluation.

Conclusion

This small-scale exploratory study suggested that the sample of educators who attended the NEAYC Creativity workshop and filled in the questionnaire recognized the value of story-based problem solving activities in the early childhood curriculum. However, few of them often used problem solving in their settings. This was due to a number of factors that influenced their practice in early childhood settings including the quality of their initial training that affected their knowledge of children's learning and how state literacy standards for children in Pre-kindergarten – grade 3 could be effectively used in their settings.

Most educators, parents and policy-makers want the highest standards in all areas, rather than in particular areas of the early childhood curriculum. However, how state standards are met and why some subject areas are emphasized over others has to be questioned. It would appear that many young children do not always get the early childhood educators that they need and deserve. Many in the study did not have sufficient training to fully envisage children's learning, to effectively meet State standards for English Language Arts or to use problem solving to promote children's literacy development. As a result, there is a need for more funded professional development opportunities for early childhood educators who are not well trained but work in settings now. With secure early childhood training, educators are more likely to implement an early childhood curriculum that features creative problem-solving activity and meets State Learning Standards appropriately. The early childhood education community can then be optimistic that children's early learning is well supported by skilled and knowledgeable professional educators.

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Appendix 1: Questionnaire to Educators

The Lighthouse Keeper's Lunch:
Problem-solving Activity

1. How long have you taught in settings? (check one)
    Under 1 year;   2-5 years;   6-10 years;   11-15 years;   20+ years
2. What qualifications do you have to work in settings? (check one)
    High school diploma; associates degree; associates degree in E.C.E.; bachelor's degree;
    Bachelor's degree in E.C.E.
3. What is your job in the early childhood? (check one)
    Teacher;   associate teacher;   classroom aide;   carer
4. What sort of early childhood setting do you work in? (check one)
    Day care;   early childhood;   private kindergarten;   pre-K;   nursery;   home.
5. Would you use a problem-solving activity in your classroom?   Yes/ No
6. What type of classroom do you work in?
7. Do you think problem-solving activities help children's learning?   Yes/ No
    Explain your answer.
8. What skills did you use in this problem-solving activity?
9. What did you think about in order to solve the problem?
10. What other resources would you have liked to do the problem-solving activity?
11. What part would you, as the educator play during this problem-solving activity?
12. How often do you use problem-solving activities in your classroom?
    o   Often – once a month
    o   Occasionally – once a semester
    o   Rarely – once a year
13. Explain your frequency of using problem-solving activities?