
Relationship between Problem Solving Approaches and Academic Performance: A Case of Kakamega Municipality, Kenya

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Abstract

The problem of poor performance of students in public secondary schools in the national examination continues unabated despite numerous efforts and resources put into education development. The study sought to determine the relationship between problem solving approach and academic performance and to establish gender differences in the problem solving approaches among secondary school students in Kakamega Municipality. Correlation research design was adopted for the study. Using stratified sampling, six schools consisting of one boys school, one girls school, three public co-educational schools and one private co-educational school were sampled. Proportionate and simple random sampling was used to select a total of 200 students comprising of 113 boys and 87 girls. Questionnaires, observation check lists and Focus Group discussions were used to collect data. Quantitative data collected in the field was analysed using descriptive and inferential statistics, while qualitative data from Focus Group Discussion was analysed qualitatively. The differences between groups on studied variables were tested using t-test while correlation was used to test the null hypothesis at a significance level of .05. There was no significant relationship between problem solving approaches and academic performance while gender had no effect on problem solving. It was recommended that counsellors and secondary school teachers should train students in positive problem solving skills and an ideal environment should be

created for students to acquire positive problem solving skills.

Key words: Problem solving approach, academic performance and gender differences

1. Introduction

Problem solving refers to the ability to come up with workable solutions to different problem situations and it involves appreciating the nature of the problem by analysing the causes and looking for possible solutions (KIE, 2008). Problem solving skills help young people cope with various challenges and demands in their lives and take responsibility of their actions. Problem solving is considered a coping strategy that increases general competence and adaptation in the real world setting. Many of our daily activities involve problem solving of some sort (Antoni & Albert, 2004) while Mayer and Wittrock (2006) assert that problem solving is fundamental to education because educators are interested in improving students' ability to solve problems. To Mayer and Wittrock, problem solving is personal and it depends on the knowledge and skills of the problem solver.

Problem solving approach may be positive or negative and there are many approaches to problem solving depending on the nature of the problem and the people involved in the problem. Rafique (2005) notes that traditional rational approach involves clarifying description of the problem, analysing causes, identifying alternatives, assessing each alternative, choosing one, implementing it, and evaluating whether the problem is solved or not. Appreciative inquiry, a kind of problem solving approach is mainly used in solving social problems which involves identifying best times about a past situation, wishing and thinking about what worked best then, visioning what one wants in the future, and building from one's strengths to work towards the vision (Canter 2004). The approach asserts that 'problems' are often the results of our own perspectives on a phenomenon such that if we look at it as a problem, then it certainly becomes one and we would probably get very stuck on the problem.

Hypothesis testing is yet another problem solving approach and assumes that each problem has a possible explanation and all one has to do is to try to prove or disapprove the assumption in some context (Ketelhut, 2007). Here, the learner acquires knowledge by actively exploring a domain, testing hypothesis about their correctness, creating solution proposals for problems, analysing the proposals and providing help and explanations, making use of an oracle or some expert knowledge base. Lateral thinking as a problem solving approach entails altering the perception of a problem particularly in situations where pure logic may not be useful. In lateral thinking, the cause of the problem is irrelevant since you have to think of the answer first and then figure out why it fits the facts (De Bono, 2006). Brainstorming approach to problem solving involves making associations and combines a relaxed, informal approach to problem solving with lateral thinking. Brainstorming is more ideal in a group since it generates more ideas than normal group problem solving (Paulus, 2000).

Humanistic therapy to problem solving is where a therapist helps people to get in touch with their inner selves, with their true feelings without undue concern for what others think (Lutomia and Sikolia, 2002). It contends that a mature and well adjusted person chooses what is innately satisfying and actualising. Conditions that enable the client to discover their own judgement about what they need, what they want and how they may maintain and enhance themselves should be created. In none directive problem solving approach, observes Harris (2004), a counsellor role is merely supportive and is based on the premise that the counselee is responsible for him/herself and is capable of solving his/her own problems, wants to be understood, and has feelings that deserves to be respected. The counselee is listened to and helped to verbalize his/her thoughts.

Divide and conquer is a type of problem solving approach where a problem is divided into smaller sub-problems in such a way that the solution to the sub problems yields a solution to the original problem. The dividing process continues until a problem small enough to be conquered easily is arrived at (<http://www.bcp.psych.ualberta.ca>). Research is also viewed as a good approach to problem solving and involves learning by doing. Here an individual or a group of people identify a problem, do something to resolve it, see how successful their efforts were, and if not satisfied try again (Brian, 1998). During research the researcher must pay close attention to ethical consideration in the conduct of the work.

These problem solving approaches are all important. However, Sternberg (1995) argued that problem solving process differs across knowledge domains and across levels of experts. A study by Scott (2007) to determine the effect of problem solving approach on team performance found that teams whose members had similar problem solving approaches solved the puzzle 80% of the time, therefore performing better in the team environment. Richards (2003) on the other hand acknowledged that team members knowledge and expertise was not enough for a team to obtain the desired results, but individual problem approaches were more important.

Yussof (2010) contends that the processes of growth and development coupled with school training cause lots of stress among adolescents. However, the outcome of the stress largely depends on the learners' coping abilities since persistently high stress levels impair students' academic achievement, personal and professional development. Tenenbaum (2008) notes that the most frequent coping strategies used by students were religion, positive reinterpretation, use of instrumental support, active coping and planning and externalizing and seeking social support, while Andelt (2002) found that students' coping strategies depend on their temperaments which affected their grade point average. Studies by Nansel (2001), Sapouna (2008) and Smokowski and Kopasz (2005) on how students cope with bullying showed that children experience fear in facing humiliation of verbal, physical and relational aggression and as a result often suffer psychological ill effects (Kochenderfer, Ladd and Skinner, 2002). Thus, training students on positive coping strategies, reducing stressors related to school training, and improving parent and teacher supports to the students would help to improve their condition (Yussof, 2010).

Difference in problem solving approaches between secondary school boys and girls have been identified in some studies. Welten and Lloyd (2008) observed that gender preferences for problem solving are as a result of social conditioning and child rearing with boys being encouraged more often to be independent while females are expected to comply. This may influence choice of copying mechanism by each gender. Frydenberg and Lewis (2004) investigated ways in which boys and girls cope with main concerns in their lives. Clear differences were found where girls sought more social support and were more likely than boys to focus on relationships, and employed more strategies related to hoping for the best and wishful thinking.

Conner (2008) observed that female students can focus on more than one problem at a time and frequently prefer to solve problems through multiple activities at a time and that male and female students approach problems with similar goals but with different considerations. While male and female can solve problems equally well, their approach and their process are often quite different. For most women sharing and discussing a problem presents an opportunity to explore, deepen or strengthen the relationship with the person they are interacting with. Women are concerned about how problems are solved than merely solving the problem itself. However, Raaheim (2008) found that female subjects in Scandinavia did as well as males on practical construction problems presented in writing. No gender difference was found on a functioning naming test, but male subjects were found to be superior when the task was to list replacement for missing implements. Men are essentially built for physical confrontation and the use of force. Men have a tendency to dominate and to assume authority in a problem solving process.

Girls tend to elicit discussion and employ collective intelligence to a task to discover a way out while boys search and explore using structured links and a chain of command. Male and female consider and process information differently to such an extent that females are prone to becoming overwhelmed with complexities that exist or may not exist and have difficulty separating their personal experience from problems while males have the ability to separate themselves from problems and minimise the complexities that may exist. Men may work through a problem repeatedly, talking about something over and over rather than trying addressing the problem at once (Raaheim, 2008).

Baron (1998) observed that there are two factors that affect problem solving and by extension the academic performance. First is an individual's mental set where there is a tendency to stick to a familiar method of solving particular types of problems that has worked out before. However, Baron thinks that better alternatives could exist for solving problems and this could result into better performance. Secondly is functional fixedness - a tendency to think of using objects only as they have been used before. Finding solutions to problems may require one to overcome functional fixedness if a better alternative use of objects was found.

Using problem solving and study behaviour inventories, Salami and Aremi (2002) found that

problem solving ability was significantly predictive of study behaviour. Effective problem solvers were reported to have better social skills and were academically above average. Antoni and Albert (1999) study on impulsive and careless problem solving style as prediction of subsequent academic achievement showed that social problem solving ability significantly predicts academic performance. Qin and Johnson (2010) study on cooperative verses competitive efforts and problem solving revealed that members of cooperative teams outperformed individuals competing with each other. The results held for individuals of all ages and for students of high, medium and low quality. Pugh (2006) observed that teaching problem solving only affects students with low problem solving abilities that would have dropped out of class. Teaching this strategy helped them remain in class and succeed.

According to Canter (2004), teachers who practice good thinking and problem solving strategies themselves are more likely to model and communicate these to their students than teachers who don't use such strategies. Pinder (2000) reported that effective problem solvers tend to have a more internal locus of control, use more problem focused copying strategies, have fewer irrational thoughts and are more confident about their decision making ability. This makes them perform better academically than ineffective problem solvers. Pinder also noted that for students to perform successfully, they have to possess competencies in organising their time, effective study of course materials, and programme requirements and being capable of meeting academic requirements for successful completion of course and programmes.

2. Research Methodology

The study was carried out in Kakamega Municipality, Kakamega Central District in Kakamega County. The region was chosen because as a geographical area, it provided a heterogamous population of students from different socio-economic backgrounds. Besides, the Municipality Education Board (MEB) and key stakeholders have questioned the persistent poor academic performance in the Kenya Certificate Secondary Examination (KCSE) for the last five years despite heavy investment in personnel and physical facilities (MEB, 2010). The Ministry of Education (2009) indicated that secondary education is a crucial level at which decisions are made by students about their future since many important career decisions are made at this level. According to Copi and Cohen (2001), for each problem solved successfully, another door to new challenges for the inquiring intellect opens. Since there are many approaches to problem solving based on the nature of the problem and the people involved, teaching and equipping students in problem solving skills may be a solution to enhanced academic performance.

The study employed a correlation research design that allowed for determination of the co-efficient of correlation that existed between problem solving approaches and academic performance in addition to its capacity to provide information concerning the degree and direction of the relationship between the variables under study. The target population were form four secondary school students drawn from 17 secondary schools in Kakamega

Municipality. At the time of the study, there were 667 students. The 17 schools were categorised as either boys or girls schools or co-educational schools. Stratified sampling technique was used to select six schools; one boys and one girls schools, three public and one private co-educational schools. Using proportionate and simple random sampling methods, 200 form four students comprising of 113 boys and 87 girls were selected. Form four students were selected because of their experience and their being a KCSE bound examination class.

Questionnaires, Focus Group Discussion (FGD), document analysis and an observation checklist were used to collect data. The questionnaires had both open and closed ended questions. The questionnaire items consisted of both positive and negative problem solving strategies and were of Likert type with question 1-12 and 13-24 consisting of positive and negative problem solving approaches respectively. A high score on question 1-12 was indicative of positive problem solving strategies while a high score on question 13-24 was indicative of negative problem solving strategies. The highest score was 65 while the lowest score was 13. The joint mock examination results were used and only scores for three compulsory subjects - English, Mathematics and Kiswahili were extracted for correlation purposes. In addition, the students' discipline records book that showed students' cases of fighting, use of abusive language, and harassment of fellow students / prefects was sought. Focus Group Discussion was used to get students and student leaders who talked about the difficulties they encountered in solving their daily problems and how they went about resolving them. Finally, observed behaviours displayed by students as they went about relating in school were recorded in the observation checklist.

Data from the questionnaire was analysed quantitatively by organising it themes reflecting the research objectives. Students' average score on each sub-scale of the questionnaire was computed. Correlation analysis was carried out between problem solving approaches and academic performance by use of correlation (regression) model while t-test analysis was used to establish the significant gender difference in problem solving approaches using SPSS version 12.0 for Windows. The null hypothesis was tested at .05 level of significance.

3. Results and Discussion

The main objective of the study was to establish the relationship between problem solving and academic performance among secondary school students in Kakamega Municipality. The aspects correlated were positive problem solving, negative problem solving in relation to academic performance and general problem solving approaches verses academic performance. Table 4.1 presents a summary of mean scores of positive problem solving and academic performance of the form four respondents.

Table 4.1. Correlation between Positive Problem Solving Approaches and Academic Performance

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|-------|--------------------------|-----------------------------|------------|---------------------------|--------|-------|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 63.368 | 7.775 | | 8.150 | .000 |
| | Mean of positive methods | -4.702 | 2.387 | -0.139 | -1.970 | 0.050 |

There was a negative correlation between positive problem solving approaches and academic performance ($r = -0.139$). The constant value was 63.368 with P value of 0.000. Thus, the constant is significant. However, the negative correlation of -0.139 between positive problem solving approaches and academic performance indicates that there is no significant relationship between the two variables. This implies that positive problem solving does not significantly affect academic performance. These findings runs contrary to a study carried out by Salami and Ajayi (2002) and Lane (2007) both of whom found a significant positive relationship between positive problem solving approaches and academic performance. Effective problem solvers were reported to have better social skills and were academically above average. The difference in the findings could be due to differences in cultural and environmental influences of the respondents.

Table 4.2 shows the Regression Model on the relationship between negative problem solving approaches and academic performance.

Table 4.2. Relationship between negative Problem Solving Approaches and Academic Performance

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|-------|-----------------------|-----------------------------|------------|---------------------------|-------|------|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 41.178 | 6.175 | | 6.668 | .000 |
| | Mean negative methods | 2.106 | 1.832 | .081 | 1.150 | .252 |

Table 4.2 shows a correlation value of 0.081 and a P value of 0.252 between negative problem solving and academic performance implying that there was no significant relationship between the two variables. However, a constant value of 41.178 with a P value of 0.00 meant that there were other factors other than negative problem solving approaches that may significantly affect academic performance other than what was being investigated. Although Antoni and Albert (1999) study showed that negative problem solving ability was significantly predictive of academic performance, this study finding shows the contrary. An

individual's culture and environmental influences may have an impact on how issues are dealt with and this may be the difference between the two studies.

The study also sought to establish whether there were differences in problem solving approaches between boys and girls in Kakamega Municipality and whether the differences were significant. The table 4.3 presents negative problem solving approaches between male and female secondary school students.

Table 4.3. t-test Testing the Difference in Negative Problem Solving Approaches between Male and Female Students

| | Gender | N | Mean | SD | t |
|-------------------------------------|--------|-----|-------|-------|-------|
| Negative problem solving approaches | Male | 113 | 40.52 | 6.384 | 1.504 |
| | female | 87 | 39.09 | 7.023 | |

Table 4.5 shows that boys scored a mean of 40.52 with a standard deviation of 6.38 in negative problem solving approaches while girls had 39.09 with a deviation of 7.02. The differences in mean scores in negative problem solving approaches was not significant ($t=1.505$, $p<0.05$, df 198). Thus, gender of an individual student does not influence negative problem solving approaches among students in Kakamega Municipality. This scenario could be due to modernity where both male and female are socialised to view tasks not as masculine or feminine. Although it was further noted that both boys and girls adopted negative problem solving approaches in equal measure, these findings echo Welten and Lloyd (2008) observation that gender preferences for problem solving may be as a result of social conditioning and child rearing where boys are encouraged to be independent while females are expected to conform. According to Raaheim (2008) males are essentially built for physical confrontation and use of force in problem solving unlike females who tend to use discussion and employ collective intelligence to a problem as a means of finding a way out.

The difference in positive problem solving approaches among male and female in Kakamega Municipality was also sought and the results are summarised in Table 4.4.

Table 4.4. t-test testing the Difference in Positive Problem Solving Approaches between Male and Female Students

| | Gender | N | Mean | SD | t |
|-------------------------------------|--------|-----|-------|-------|--------|
| Positive problem solving approaches | Male | 113 | 38.45 | 6.119 | -1.185 |
| | female | 87 | 39.40 | 4.912 | |

A mean score of 38.45 was found for positive problem solving approaches with a deviation of 6.119 for boys while a mean of 39.40 and a deviation of 4.912 was obtained for girls. However, a t-test showed that the gender differences between positive problem solving approaches were not significant ($t = -1.185$, $p<0.05$, df 198). This meant that gender had no

major effect on positive problem solving approaches between secondary school boys and girls. Changes in the social set up and sameness in school environment may provides a level playing field for both the male and female students and may therefore have an insignificant effect on the way each gender approaches and solves challenges encountered. The result negates Frydenberg and Lewis (2004) observation that there were clear differences between boys' and girls' approaches in coping with their concerns.

On the overall difference between male and female students in problem solving approaches, the findings are presented in Table 4.7.

Table 4.7. T-test Testing the Overall Difference in Problem Solving Approaches between Male and Female Students

| | Gender | N | Mean | SD | t |
|---|--------|-----|--------|--------|------|
| Overall score on problem solving approaches | Male | 113 | 78.681 | 7.4225 | .175 |
| | Female | 87 | 78.494 | 7.6095 | |

Male ($\bar{X}=78.68$) and female ($\bar{X}=78.49$) students had almost similar average scores on both positive and negative problem solving approaches. A t-test did not find any significant differences between male and female overall scores problem solving approaches ($t=.175$, $p<0.05$, df 198). Although there were no significant differences in the mean scores on both positive and negative problem solving approaches, it is worthy noting that boys had a slightly higher average than the girls. However, these findings is contrary to Conner (2005) who noted that male and female students approach problems with similar goals but with different considerations and that while boys and girls can solve problems equally well, their approach and their process are often quite different. Conner's study was done in a Western European setting and that may account for differences in this study finding which was done with respondents of Kenyan background. In addition, urban influence cannot be totally ruled out.

4. *Conclusions and Recommendations*

There is no significant correlation between both positive and negative problem solving approaches and academic performance. This indicates that neither positive nor negative problem solving approaches affect academic performance. There must be other factors that significantly affect academic performance that this study was not able to establish. Similarly, there is no significant difference in problem solving approaches between male and female students since both were found to adopt positive and negative problem solving approaches in almost similar ways. It was recommended that training in acquisition of positive problem solving skills should be part and parcel of school orientation programme and that such skills should be inculcated in the learners right from the time they join school.

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