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Use of Learner-Learner Dialogue Approach in Minimization of Learner Errors in Mathematics in Primary Teacher Training Colleges in North Rift Region

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Abstract
Studies indicate that majority of the learners in teachers training institutions do not perform well in mathematics because they make different types of errors. The purpose of this study was to establish the use of learner-learner dialogic approach in minimizing learner errors in mathematics classes in Public Primary Teacher Training colleges in Kenya. This study adopted a descriptive survey research design and was guided by social constructivist theory. Simple random sampling was used to select teacher trainees while purposive sampling was used to identify heads of Mathematics department and Deans of Curriculum. Data was collected using interviews and questionnaires. Data was analyzed using frequencies, percentages and the hypothesis was tested using chi-square at 0.05 level of significance. The study established that teacher trainees operate together to improve knowledge. They help each other to learn through dialogue in which learning goals emerge and develop during dialogue. The teacher-trainees show understanding of how group processes promote their learning. Further, classroom social structures promote interdependence and assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. The study concludes that there is a significant relationship between learner-learner dialogue and minimization of learner errors (a chi-square of 18.272, d.f. =8 and p-value of 0.019). This study will help understanding on how to enhance the use of learner-learner dialogic approach in the development of mathematical concepts.

Introduction
Summative assessments used widely in schools perpetuate the misconception that making errors is punishable. According to Brodie (2014), tutors blame the learners or themselves for the errors made in classes. Treating errors as problems may disrupt learners’ confidence in their previous learned correct knowledge. Ingram, Baldry and Pritt (2015) argue that although tutors may not explicitly tell the learners that making errors is problematic, the manner in which tutors deal with errors, by avoiding opportunities for learners to make and discuss mistakes in the classroom, implicitly suggest that errors are problematic. Hansen (2011) argues that tutors need to treat errors sensitively and productively, as errors can be used as tools not only to motivate learners but also to assist them in developing their conceptual knowledge by learning from their errors. Ness and William (2009) contend that dialogue is a process of inquiry and learning that is based on openness, listening developing meaning, and sharing knowledge through conversation. It is a collaborative approach to discussion that seeks to build awareness, challenge assumption and reach deeper understanding of issues. In the dialogic teaching communicating effectively with others is fundamental to knowing and learning. Such a perspective places importance on building on prior knowledge, which, in this case, refers to the skills and concepts required for learners to meaningfully engage in learning experiences and struggle for understanding, rather than knowing exactly how to solve the problem due to prior exposure to very similar examples (Munter et al., 2014). Studies indicate that for attainment of quality education dialogue is a key factor. Mercer (2008) argues that dialogic teaching can increase learner’s capacity for dialogue and development of individual and group reasoning skills and therefore enabling attainment in Mathematics. Further, Philip and Wegerif (2016), assert that being better at dialogue means learning how to ask better questions, how to listen better, not only the words but also the implicit meaning, how to be open to new possibilities and perspectives, while of course learning how to think
Literature and Hypothesis Development

The unequivocal educating of how students are required to react and associate during a study hall conversation in Mathematics is essential. Students sharing their reasoning should realize that their clarification require something beyond a portrayal of the methodology they used to take care of an issue. Or maybe, (students) need to incorporate a type of virtual portrayal, alongside a clarification of how they created the issue and why they decided to take care of the issue that way (Anderson et al, 2009). Students who are listening ought to be mindful to the considering others, ponder the thoughts they have heard to assess their productivity, decide whether they concur or deviate, on the off chance that they comprehend the thinking about their friends and what similitudes or contrasts they see between their own reasoning and the considering others students should be instructed how to concur and differ and how to approach inquiries for explanation. Nevertheless, some studies suggest that enhancing dialogic inquiry and genuine learner engagement in productive interactions is a highly demanding task (Kumpulainen & Lipponen, 2010). Research further demonstrates that dialogic connections are not usually seen in study halls and educators' consciousness of how open practices unfurl and their productive job in the process is constrained (Nystrand et al., 2003). School culture as a rule anticipates that members should follow a specific arrangement of conversational ‘ground jobs’ that dishearten students’ thinking (Mercer & Hower, 2012). Mercer and Littleton (2007) posit that dilemmas of tutors are elevated by research that youngsters learn all the more adequately and scholarly accomplishments are higher when they are effectively occupied with academic activity through conversation, exchange and argumentation. These equips children with the necessary skills and habits of mind required in the modern world to develop the critical reasoning and inquiry skills that enable them participate effectively in the wider mathematical communicative practices to which they have increasing access. Much effort has been made to ensure qualified tutors are employed. Increased remuneration and improvement of terms of service for tutors, provision of teaching and learning resources in Kenyan public tutor training institutions have been promoted or attempts have been made to provide. Despite all these, nearly half of teacher-trainees who sit primary education training courses fail the final examinations in mathematics. An analysis of the KNEC data reveals that for the last three years, a total of 29,595 out of 73,032 (41 per cent) failed (KNEC, 2018). Mathematics is one of the subjects examinable in PTE examinations. As indicated by Brodie (2013), lion's share of the students doesn’t perform well in arithmetic since they make various kinds of mistakes. It is against this background that the study sought to determine how learner-learner dialogic interaction could be applied in minimization of learner errors in Mathematics classes in public primary teacher training colleges in the North Rift region of Kenya. The study was guided by the following hypothesis.

H01: There is no significant relationship between learner-learner dialogue and minimization of learner errors in mathematics classes in public primary teacher training colleges in the North Rift region of Kenya.

Research Design and Methodology

The study covered selected public teacher training colleges in North Rift Region, Kenya. The public primary teacher training colleges in this region are Mosoriot teacher training college in Uasin Gishu County, Tambach teacher training college in Elgeyo Marakwet County, Baringo teacher training college in Baringo County and Chesta teacher training college in West Pokot County. The investigation was secured in social constructivism theory. As per Westwood (2008), students are self-persuaded and automatic creatures who will procure the crucial abilities of persuing, composing, spelling of, taking part in, and conveying about age fitting, important exercises each day. A descriptive survey design was used in the study. This investigation was guided by the social constructivist system hypothesis. The target population of the study was four public teacher training colleges in North Rift, Kenya. The targeted respondents were heads of department (Mathematics Department), four Deans of Curriculum and 1980 learners in the second year of study. Learners in their second year of the course was selected on the basis that they have vast knowledge in instructional approaches having taken three teaching practices. Data was collected from all the four public primary teacher training colleges in the North Rift, Kenya. Out of the total 1980 second year teacher-trainees from the sampled colleges, the researcher selected 322 (16.3%) teacher-trainees. Purposively, 8 tutors of second year mathematics teacher trainees, 4 heads of department and 4 deans of curriculum participated in the study. The respondents were selected proportionately from each of the colleges where the study was done. Simple
random sampling was used to identify individual participants in the study. Data was collected using questionnaire, document analysis, interviews and observations schedules. The tutors were subjected to interviews and filling of questionnaires. Observations were made during class interactions. The data was analyzed using frequencies and percentages while chi-square was used to test the hypothesis. Data was presented in terms of frequency tables and pie charts.

**Research Findings**

**Background Information**

Study sought information on gender and age bracket of the respondents. The responses are presented in the following subsections:

**Gender of Respondents**

Findings on gender of teacher trainees who participated in this study is shown in Figure 1.

![Gender of Respondents](image)

**Figure 1 Gender of Respondents**

As shown in Figure 1, majority (61.5%) of the teacher-trainees were female while 38.5% (100) were male. This shows that there were more female teacher-trainees than male teacher-trainees.

**Age Bracket of Respondents**

The respondents were asked to state their age bracket. The respondents are presented in Figure 2.

![Age Bracket of Respondents](image)

**Figure 2 Age Bracket of Respondents**
Figure 2 shows that 49.2% (128) of the teacher trainees were 25-29 years old while 28.8% (75) were 20-24 years old and 17.3% (45) were 30-34 years old. Only 4.6% (12) were below 20 years of age. Thus the majority of teacher-trainees were aged between 25-29 years.

**Dialogic Approaches**

Teacher trainees who participated in this study were asked to state their opinion concerning the use of dialogic approaches. Their responses are presented in Table 1.

<table>
<thead>
<tr>
<th>Statement</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialogic approach promotes talking and thinking together and help learners understand Math better</td>
<td>6</td>
<td>2.3</td>
<td>18</td>
<td>6.9</td>
<td>0</td>
<td>135</td>
</tr>
<tr>
<td>It is necessary for more than one person to help solve challenging questions</td>
<td>8</td>
<td>3.1</td>
<td>19</td>
<td>7.3</td>
<td>5</td>
<td>126</td>
</tr>
<tr>
<td>There is a great deal to be learned from listening to how others think.</td>
<td>10</td>
<td>3.8</td>
<td>17</td>
<td>6.5</td>
<td>45</td>
<td>125</td>
</tr>
<tr>
<td>Talking about your thinking helps you to clarify your own thoughts.</td>
<td>5</td>
<td>1.9</td>
<td>7</td>
<td>2.7</td>
<td>10</td>
<td>126</td>
</tr>
<tr>
<td>When talking about the mathematics, you practice using important math vocabulary.</td>
<td>21</td>
<td>8.1</td>
<td>16</td>
<td>6.2</td>
<td>26</td>
<td>105</td>
</tr>
<tr>
<td>You can learn a great deal about what it takes to understand the ideas of others.</td>
<td>0</td>
<td>0.0</td>
<td>19</td>
<td>7.3</td>
<td>26</td>
<td>115</td>
</tr>
</tbody>
</table>

It is revealed that 90.7% (236) of the respondents agreed that dialogic approach promotes talking and thinking together and help learners understand mathematics better. However, 9.2% (24) disagreed. There were 87.7% (228) of the teacher trainees who stated that it was necessary for more than one person to help solve challenging questions while 10.4% (27) disagreed, and 1.9% (5) remained neutral. Further, the study established that 72.3% (188) of the respondents agreed that there was a great deal to be learned from listening to how others think, 10.4% (27) disagreed. Majority (91.6%) of the respondents stated that talking about their thinking helps them to clarify their own thoughts while 4.6% (12) disagreed and 3.8% (10) were neutral. The study also established that 75.8% (197) of the teacher trainees who participated in this study stated that when talking about the mathematics, they practice using important math vocabulary. However, 14.2% (37) disagreed.

It was also revealed that 82.7% (215) of the respondents stated that they can learn a great deal about what it takes to understand the ideas of others whereas 17.3% (45) disagreed and 10% (26) were neutral. In spite of the fact that talk is a focal element of tutoring and training and a developing zone of instructive research, there is by all accounts a hole between homeroom real factors and hypotheses of learning and advancement that stress the significance of social communication. Starting with examiners supporting the highlights of dialogic teaching method, the discoveries of Nystrand et al., (1997) for instance, show that various styles of correspondence affect student learning. Regardless of this, student learning has regularly been related with utilization of open inquiries (She and Fisher, 2002). Nystrand et al., in any case, caution against estimating the connection among learning and informative styles by concentrating on, for example, the sort of inquiries utilized through the span of an exercise (Molinari and Mameli, 2010). Dialogic Pedagogy is upheld by expanded utilization of legitimate, theme pertinent inquiries with respect to the guide, however progressively fundamental is the nature of the correspondence that encompasses those inquiries (Nystrand, Wu, Gamorgan Zeiser and Long, 2003).

**Learner-Learner dialogue**

The study sought to establish how learner-learner dialogic interaction could be applied in minimization of learner errors in mathematics classes. Teacher
The findings shown in Table 2 reveals that 78.1% (229) of the respondents agreed that the teacher trainees operate together to improve knowledge while 7.7% (20) disagreed. Another 88.1% (229) asserted that teacher trainees help each other to learn through dialogue whereas 7.3% (19) disagreed and 4.6% (12) were neutral. Majority (83.8%) of the respondents stated that learning goals emerge and develop during dialogue while 16.2% (42) disagreed and 10.8% (28) were neutral. There were 76.5% (199) of the teacher trainees who agreed that they review how best the community of trainees support learning whereas 13.1% (34) disagreed and 21.2% (55) were neutral. There were 84.6% (220) of the teacher-trainees who stated that they show understanding of how group processes promote their learning while 15.4% (40) disagreed and 5.4% (14) were neutral. As stated by 50.7% (132) of the respondents, classroom social structures promote interdependence while 28.8% (75) disagreed and 20.4% (53) were neutral. More than half (56.9%) of the respondents stated that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. However, 21.5% (56) disagreed and 21.5% (56) were neutral.

Chi-square was used to establish whether there existed a significant relationship between learner-learner dialogue and minimization of learner errors in mathematics classes in public primary teacher training colleges in Kenya. The first hypothesis was stated as:

H0: The null hypothesis stated that there is no significant relationship between learner-learner dialogue and minimization of learner errors in mathematics classes in public primary teacher training colleges in Kenya. However, showed a significant relationship as indicated in table 3.

Table 3: Chi-square results on relationship between learner-learner dialogue and minimization of learner errors in mathematics

<table>
<thead>
<tr>
<th>Value</th>
<th>Df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>18.272</td>
<td>.019</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>260</td>
<td></td>
</tr>
</tbody>
</table>
As shown in Table 3, a chi-square of 18.272, d.f. = 8 and p-value of 0.019 was obtained. Since p < 0.05, the null hypothesis is rejected which implies that there is a significant relationship between learner-learner dialogue and minimization of learner errors in mathematics classes in public primary teacher training colleges in Kenya.

Regardless of endeavors to set up a justification for conversations and desires for tuning in, rich conversations in Mathematics don't occur by some coincidence. The unequivocal instructing of how students are relied upon to react and collaborate during a homeroom conversation in Mathematics is important. Students sharing their reasoning should realize that their clarification require something beyond a depiction of the procedure they used to take care of an issue. Or maybe, (students) need to incorporate a type of virtual portrayal, alongside a clarification of how they demonstrated the issue and why they decided to take care of the issue that way (Anderson et al., 2009). Students who are listening ought to be mindful to the considering others, ponder the thoughts they have heard to assess their proficiency, decide whether they concur or deviate, on the off chance that they comprehend the thinking about their companions and what likenesses or contrasts they see between their own reasoning and them considering others students should be instructed how to concur and differ and how to approach inquiries for explanation.

So as to assist student's with condensing and comprehend their deduction just as them considering others, it is fundamental to give chances to students "turn and talk" about thoughts. For example, in the wake of introducing an issue, students might be approached to speak to or state in their own words what the issue is asking, at that point share that with the accomplice. In the wake of finding a passage age and taking care of an issue freely, students should impart their techniques to an accomplice or in a gathering, preceding offering to the entire class. This gives students work on developing contentions, giving defense and investigating the considering others. Students find a workable pace to tune in in a way that sets them up to repeat their accomplices thinking in their own words, just as tuning in to comprehend and offer conversation starters of their accomplice. Organizations guarantee a more significant level of responsibility and students commitment than is conceivable with just entire gathering study hall discourse. An amazing instructional move after students have heard them considering others is to send them back to work in accomplices or in little gatherings to think about the contentions of others. Cautiously all around made inquiries are utilized to help manage the exchange.

**Conclusion**

It is revealed that 90.7% (236) of the respondents agreed that dialogic approach promotes talking and thinking together and help learners understand mathematics better. However, 9.2% (24) disagreed. There were 87.7% (228) of the teacher trainees who stated that it was necessary for more than one person to help solve challenging questions while 10.4% (27) disagreed, and 1.9% (5) remained neutral. Further, the study established that 72.3% (188) of the respondents agreed that there was a great deal to be learned from listening to how others think, 10.4% (27) disagreed. Majority (91.6%) of the respondents stated that talking about their thinking helps them to clarify their own thoughts while 4.6% (12) disagreed and 3.8% (10) were neutral. The study also established that 75.8% (197) of the teacher trainees who participated in this study stated that when talking about the mathematics, they practice using important math vocabulary. However, 14.2% (37) disagreed. It was also revealed that 82.7% (215) of the respondents stated that they can learn a great deal about what it takes to understand the ideas of others whereas 17.3% (45) disagreed and 10% (26) were neutral.

The findings revealed that 78.1% of the respondents agreed that the teacher trainees operate together to improve knowledge while 7.7% disagreed. Another 88.1% asserted that teacher trainees help each other to learn through dialogue whereas 7.3% disagreed and 4.6% were neutral. Majority (83.8%) of the respondents stated that learning goals emerge and develop during dialogue while 16.2% disagreed and 10.8% were neutral. There were 76.5% of the teacher trainees who agreed that they review how best the community of trainees support learning whereas 13.1% disagreed and 21.2% were neutral. There were 84.6% of the teacher-trainees who stated that they show understanding of how group processes promote their learning while 15.4% disagreed and 5.4% were neutral. As stated by 50.7% of the respondents, classroom social structures promote interdependence while 28.8% disagreed and 20.4% were neutral. More than half (56.9%) of the respondents stated that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. However, 21.5% disagreed and 21.5% were neutral.

Based on the findings of the study, it can be concluded that dialogic approach promotes talking and thinking together and help learners understand mathematics better. Majority of the teacher trainees stated that it was necessary for more than one person to help solve challenging questions and that there was a great deal to be learned from listening to how others think. It was also established that when teacher-trainee talk about
their thinking helps them to clarify their own thoughts. In relation to learner-learner dialogic interaction, the study established that teacher trainees operate together to improve knowledge. They help each other to learn through dialogue in which learning goals emerge and develop during dialogue. The teacher-trainees show understanding of how group processes promote their learning. The respondents stated that classroom social structures promote interdependence and that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts.

Recommendations of the Study
The study recommends that teacher trainees should be encouraged to explain their responses and connections of ideas not just voice their opinions. The rational argument which supports the fact that the tutor encourages teacher trainees to explain their ideas is the key reason why tutors prefer dialogic teaching.

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