EFFECT OF MULTI-GRADE TEACHING ON STUDENTS' COGNITIVE ABILITIES IN MULTI-GRADE LITERACY CENTERS OF PUNJAB

Ghulam Ahmad[1], Mumtaz Akhter[2]

Original Article

1. PhD Scholar, Institute of Education and Research, University of the Punjab, Lahore.
Email: ghulamahmadakash@gmail.com

2. Dean Faculty of Social Sciences, University of Management and Technology, Lahore.
Email: drmumtazakhter@hotmail.com

Received: October, 2020
Accepted: November, 2020
Published: July, 2021

ABSTRACT

It was a quantitative study for the dissertation of Ph. D. The aim of the study was to explore the effects of multi-grade teaching on the cognitive abilities of students of literacy centers of Punjab. All the students of grade V studying in literacy centers and formal public schools of the Punjab were population of the study. The researchers took the sample from all the students of grade V of literacy centers of Rawalpindi and equal number of their counterparts from formal schools of Rawalpindi. The collected data were analyzed by using t-tests, means and standard deviation with the help of SPSS. The results showed that multi-grade teaching system had no adverse impact on the cognitive abilities of literacy centers of Punjab. Compared with the per student expenditure of the Punjab government on the education of formal students and literacy learners, the study showed that much of national capital can be saved through multi-grade teaching system, with no negative impact on the cognitive abilities of students.

Keywords: multi-grade teaching, single-grade teaching, cognitive abilities, effects

INTRODUCTION

Multi-grade classes are a common feature in the world. Normally students of two or more adjoining grades are seated in the same classroom or premise and are taught mostly by single teacher or in some instances by more than one teacher. Both, developed and developing countries practice this norm. Chelule (2014) also reports that about 33 % classes across the world comprise multi-grade system. In the United States, in 2007, about 28 % schools were following multi-grade mode of teaching, as number of students was less at that time. Same is the case with the countries of Europe, especially where we find thin population. In French districts, the number of students studying in multi-grade classes is overall thirty percent. In Finland and Netherland, multi-grade

classes are more than mono-grade classes, as discussed by Mulkeen & Higgings, (2009).

Practice of multi-grade classes is partly a matter of administration. Even in developed countries, there are some areas, especially rural and mountainous areas, which experienced a drastic change in population. It became difficult to retain single grade schools for shortage of enrollment. Ultimately, District administration had to merge classes and launch multi-grade system to provide educational services to people at their door steps.

In Punjab of Pakistan, there are two streams running parallel in education system. One is single grade education system, being followed in all institutions run by School Education Department. However, there are still single teacher schools in Punjab, working under SED, especially in rural and far flung areas. The reason is low enrollment of the students and many sanctioned posts lying vacant for lack of recruitments, but major factor is low enrollment, because there are many instances in which SED had to merge schools to meet the criteria of placing teachers according to the strength of students. In this practice many schools became single teacher schools and the remaining teacher had to deal with multi-grade class. In this scenario, it is an appreciable effort on part of the Punjab government to launch literacy centers to cater those areas and their children who were out of reach of formal public schools. There is also domestic and international pressure to achieve targets of Universal Primary Education and Millennium Development Goals which led to the efforts of promoting multi-grade teaching system across the province to meet international goals.

There is multi-grade education system in all literacy centers run under the auspices of Literacy Department, Government of the Punjab. Multi-grade education system is not exceptional in Punjab, rather it is a world-wide phenomenon. Even developed countries are not exception to it. Little (2006) estimated in 2006 that almost 2 billion children were experiencing their basic education in small, multi-grade schools round the world and were becoming part of universal primary education. It is pertinent to mention that term, 'learner' is used in Literacy Department and 'student' is used in SED.

In Literacy Department, literacy centers comprise single teacher classes with minimum 25 learners. These learners range from nursery to grade V children. Teacher's qualification is at least Intermediate for Non-Formal Basic Education (NFBE) centers and Matriculation for 'Taleem Sab Key Liye' (TSKL) centers. These centers are established where we find no formal school nearby, and those children are enrolled who do not attend any public or private school. Normally these children belong to very poor strata of society and marginalized people.

So far as academic achievement is concerned, there are mixed evidences in literature. Some go in favor of multi-grade teaching, while other studies go against it. (Kadivar, Nejad, & Emamzade, 2005). School Education Department caters classes from nursery to grade XII, while Literacy Department caters classes from nursery to grade V. As age of these students studying in classes from nursery to grade V is very important in shaping the cognitive abilities of students. It becomes pertinent to probe into the effects of multi-grade system of teaching on students in scenario where most formal institutes are imparting education through single grade set ups.

In literature we find different names for multi-grade class structure as "composite", "combination classes", "double classes", "split classes", "mixed- age classes" and "vertically-grouped classes" (Veenman, 1995). According to Mason & Burns (1996) and Veenman (1995), a multi-grade class is one in which students of two or more adjoining grades are taught in a classroom by a single teacher mostly. Normally in a Multi-grade,

children belong to more than one grade class (Kadivar, Nejad, & Emamzade, 2005).

Findings indicate that, multi-grade classes have positive effect on social skills of students. Such students interact with each other and in this way they acquire social skills and behaviors from one another. Type of Multi-grade classes environment may affect the social behaviors of the learners (Kadivar et al., 2005). As students in the multi-grade classes belong to different age groups, they have the opportunity to adopt leadership and peer coaching roles and these classes work as a "family" and lead to the expansion of such roles of social growth and integrity in students as well as teacher. It means that social skills are developed in school, and this fact verifies the fact that social behaviors are acquired ones and can be learnt from social interaction. Therefore, multi-grade education has a significant positive effect on students' social behaviors (Kadivar et al., 2005).

A study conducted in Italy shows that multi-grade classes have adverse effect on literacy and numeracy scores of the learners. The study shows statistically insignificant effect on literacy score, while a significant one has been observed in numeracy scores. While no effect has been reported on grades which teachers gave to their students. It is also found that students placed in multi-grade classes have tendency to more externally centered locus of control (Checchi & Paola, 2018).

This topic occurred to me as I have been working in School Education Department as a teacher in an elementary school from 2000 to 2007 and then as headmaster of a high school from 2008 to 2017. Recently I have been working as District Education Officer, Literacy since 2017. As I have been dealing with literacy centers in my jurisdiction which are working on multi-grade model of teaching, it triggered in me the interest to investigate effect of multi-grade teaching on the cognitive abilities of the students, especially in the scenario where single-grade teaching is being imparted to students in almost all formal schools of SED.

REVIEW OF LITERATURE

School environment includes those aspects surrounding students within which teaching learning process occurs. The quality of students' learning is not only affected by teachers' performance of duties but also the physical and psychological environment (Ajao, 2001) quoted in Chuma (2012). For example, presence of libraries in the schools of developing countries has been reported to have positive effect on students' achievement (Heyneman & Loxley, 1993). In the same way, students feel difficulty in writing in overcrowded classes and teacher cannot access the poor learners and needy students easily (Wabuoba, 2011).

Social learning theory is largely associated with Albert Bandura. However, it grew from the early work of Miller and Dollard (1941). Social learning theory is an advancement in the sense that it functioned as a bridge between behaviorism and cognitivism. Behaviorism focused on environmental stimuli and rejected the mental events. On the other hand, cognitivism depended too much on mental processes. Moreover, behaviorism and cognitivism involved research on animals. Social learning theory gave weightage to both. It embraced observation of environment and mental processes and it involved research on human beings.

Literacy centers are working on the model of multi-grade teaching. Here in a single premise of class room, the students of different age and from different socio-economic background are present. They get the chance of mixing with one another. They observe and experience and their learning is affected by these factors. In formal schools in Punjab, although students are from different socio-economic background, yet they are of almost same age group. This difference may

have a significant effect on the cognitive development of the learners.

Constructivism is the synthesis of many stances, especially behaviorism and cognitivism. The "constructivist stance maintains that learning is a process of constructing meaning; it is how people make sense of their experience" (Merriam & Caffarella, 1999, p. 260). Learners build on present and past information and this process is done actively, not passively. In other words, learning is a process in which learners build knowledge while actively interacting with environmental stimuli. According to the proponents of constructivism, learners construct their own knowledge based on their personal and social experiences. Reality is thought of not as some fixed fact but as perspective knowledge. Knowledge emerges from both biological/neurological construction and social, cultural and linguistic interaction of the individuals (von Glasersfeld, 1984).

Learning is an active process. When we experience things, perceive problems and try to solve them, we use information and how information is used is very important because when information is used to solve problems, it functions as tool rather than as a fact. As learning occurs in an environment, it does matter. The interaction between learner and environment is reciprocal. Environment shapes learner and the learner is shaped by environment in turn.

Practice theory claims that learner and the environment of the learner both are active participants. However, much depends upon the motivation of the learner with respect to time and place in which learning occurs (Lave & Wenger, 1991). Previously, constructivist view emphasized on the active role of the learner in constructing meaning and concepts, while environment goes in the background. Practice theory gives to both learner and environment an active role.

Lev Vygotsky believes that children construct meaning and understanding through social interaction. They are active participants. They interact not only with other people including peers, siblings, parents and others, but also with symbolic tools of language, art and culture etc. Whole of their understanding and construction of their ideas are greatly influenced by these two factors. Thus all their knowledge is negotiated and mediated as a result of their interaction with social environment and cultural forces. When they use these tools, they also become part of this culture. Hence, their knowledge and understanding reflect social norms, beliefs and rituals of the society of which they are the part. Vygotsky is of the opinion that learning occurs at two levels. First children learn through social interaction and then they internalize this knowledge. All cognitive functions originate from social interaction and then are internalized. Hence, social factor precedes the psychological one. In this way, the learner's knowledge is collaborative and he is an active learner, not a passive 'lone scientist' as advocated by Piaget. He also developed the idea of Zone of Proximal Development (ZPD). He believes that a child has a potential to learn, but does not learn until he/she is helped by a more skilled and knowledgeable adult.

In America, theoretical basis of facility planners is that man shaped by environment is more knowledgeable and in turn creates better environment. They believe that improvement in the environment will result in improvement in academic achievement. Research indicates that improved environment has a positive impact on students' achievement. Learning environment has directly and indirectly impact on students' achievement. Good environment saves students from physical distress and they are induced to work. In this way, they feel comfortable to work and resultantly their achievement is enhanced. Indirectly, poor and uncomfortable environment induces psychological unrest and is responsible for producing negative attitude toward learning. There is no wonder that poor learning

environment has negative impact on students' achievement (Chan, 1996).

The phenomenon of multi-grade teaching varies from country to country. In some countries, this practice is as frequent as it encompasses one third of educational population of that country as has been observed in India. Contrary to it, this phenomenon reduces to only 2 % in some countries as in Korea. Here population of a country matters a lot. If we see China, multi-grade teaching practice reaches to hundreds of thousands, while in Maldives, this figure falls to as low as one hundred only. Trend is another factor. We see a reduced trend of multi-grade teaching in Japan (Birch & Lally, 1995).

Multi-grade teaching has many positive effects on the attitude of local population, but it varies from country to country depending on geographical and social context. As far as intensity and frequency of multi-grade teaching practices are concerned, many characteristics are common to all countries.

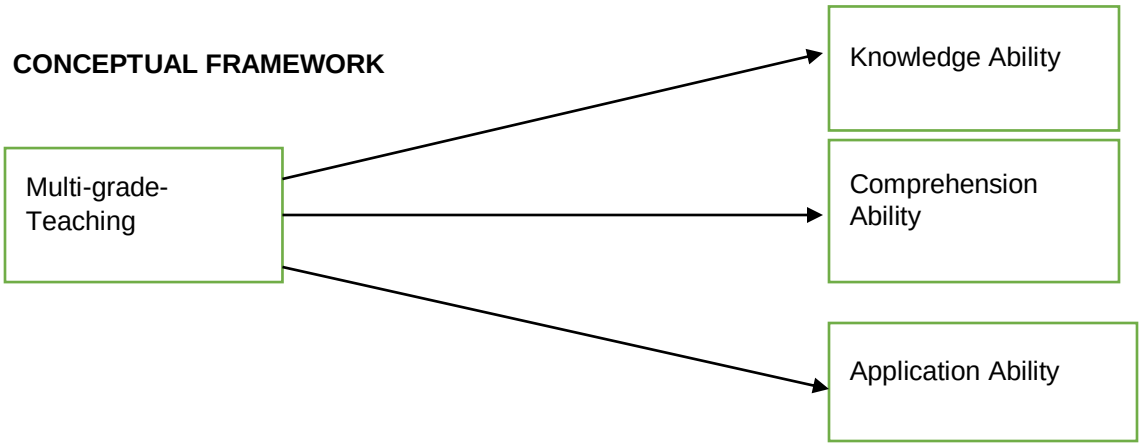
Multi-grade teaching is not a new phenomenon. It has been in practice for centuries, especially in Islamic countries. Even in those countries where compulsory primary education has been launched, this tradition is almost a century old, especially in Nepal and China or those countries which have been under foreign domination. In Indonesia and Philippines, multi-grade teaching system is gaining impetus and is likely to start a new era of multi-grade teaching in such countries.

Historical evidence may vary in different countries and areas, but practically multi-grade teaching enjoys a larger period than its single grade counterpart. However, there needs to be an extensive research in its effectiveness. Research conducted by Miller (2008) has encouraging clues in favor of multi-grade teaching system.

In recent times, a study on multi-grade teaching and its effects on the cognitive skills was conducted by Cheechi and Paola (2018) in Italy. The researchers found that learners placed in multi-grade classes scored less than their counterparts in single grade classes, in terms of literacy scores and numeracy. They found that class size did not matter statistically much in the scores. However, there were individual differences in scores. For example, female students performed better than male students. Students from good socio-economic background performed better than their counterparts from humble socio-economic background and lastly students from Italian parentage performed better than students from foreign (non-Italian) parentage.

In the same way, they did not find any statistically significant effect on teachers' assessment of their students in multi-grade classes, despite the fact that those students scored less on literacy and numeracy scores. They justified that teachers might have scored their students generously to compensate the hardships faced by them and the students in multi-grade classes (Cheechi & Paola, 2018).

CONCEPTUAL FRAMEWORK



RESEARCH METHODOLOGY

It was a causal comparative study, involving conduction of tests to collect quantitative data from grade V learners of literacy centers and their counterparts from School Education Department of Punjab. The researcher adopted quantitative research design emerging from assumptions of positivist paradigm. Further, causal comparative, a sub design of quantitative research design was used. Multi-grade teaching at literacy centers is the independent variable, while learners' cognitive abilities served as dependent variable which was split further into three dependent variables i.e. knowledge ability, comprehension ability and application ability. Quantitative data regarding cognitive abilities was collected from grade V literacy learners and their counterparts from School Education Department. In this way, respondents formed two groups. One group of grade V literacy learners from Literacy Department and the other group from grade V students from formal schools of School Education Department. These groups were equal in terms of their number, grade level, locale and curricula, with the difference that literacy learners had been taught in multi-grade mode of teaching, while students from the formal set up had been taught in single grade mode of teaching.All the literacy learners enrolled under Literacy and Non-Formal Basic Education Department and primary class students enrolled under School Education Department were population of the study. Detail of population of all literacy learners and primary students of the Punjab is given as under:

Table 1:*Detail of All Literacy Learners and Primary Students of SED of the Punjab*

All Districts of Punjab	Literacy learners	Primary Students
36	415123	4771429

Source: Literacy & Non-Formal Basic Education Department and SED, Government of the Punjab

There are nine divisions in Punjab comprising of 36 districts. They are: Bahawalpur, Dera Ghazi Khan, Faisalabad, Gujranwala, Lahore, Multan, Rawalpindi, Sahiwal and Sargodha. Last figures of consensus showed that Rawalpindi division had the highest literacy rate in all the nine divisions of the Punjab. From Rawalpindi division, district Rawalpindi was selected randomly for data collection. From all the literacy centers of literacy only those centers were taken in the sample where there were grade V students reading and an equal number of schools were selected from formal schools. However, the

turn-out of data showed that 163 students from formal schools and 135 from non-formal literacy centers participated in the study.

The researcher developed three tests in the subjects of English, Urdu and Math. As the researcher wanted to test the effects of multi-grade teaching on the cognitive abilities of students, the researcher inserted items of knowledge level, comprehension level and application level in all the three tests. Tests were prepared from text books of grade V, provided by the Punjab Curriculum and Textbook Board, as these books are currently being used by both formal and non-formal educational institutions in Punjab. The tests were piloted first on 20 learners of district Rawalpindi. After improving them in consultation with experts and ensuring their reliability, they were then applied to the whole of the sample. Test was the basic tool of data collection in this study. Three tests in subjects of English, Urdu and Math were developed and the researcher himself went from school to school to conduct tests. After taking collection of solved tests papers, the researcher marked them put the data in SPSS to draw results. Quantitative data got from literacy learners and students of formal set up was analyzed by using SPSS version 19. Mean and standard deviation were the major statistical tools, while independent sample t-test was applied to find the significance of the difference between the means.

Although there were a number of cognitive abilities found in literature, researcher selected only knowledge ability, comprehension ability and application ability, keeping in view the educational context and age of the literacy learners, as these abilities are mostly related to these students, while investigating the effect of multi-grade teaching on the cognitive abilities of the learners. Literacy centers in the Punjab cater learners from grade I to grade V. Researcher selected only grade V learners and their counterparts from students of School Education Department for collection of data, as these are the terminal classes in both formal and non-formal set ups.

RESULTS AND DISCUSSION

Table 2:*Scores in cognitive abilities (Formal vs Non-Formal students)*

Level	Type	N	Mean	St. D	T	Sig.
E. K	Formal	163	10.3160	3.68386	2.117	.036
E. K	Non-Formal	135	9.4444	3.41018		
E. C	Formal	163	7.1564	2.80460	-1.912	.000
E. C	Non-Formal	135	7.6889	1.98959		
E. A	Formal	163	4.7393	2.91036	-.169	.000
E. A	Non-Formal	135	4.7889	2.15748		
U. K	Formal	163	14.6012	3.78682	3.640	.045
U. K	Non-Formal	135	12.9556	3.96461		
U. C	Formal	163	8.9043	1.63576	-2.376	.037
U. C	Non-Formal	135	9.3222	1.40025		
U. A	Formal	163	6.6288	2.60554	-2.896	.085
U. A	Non-Formal	135	7.4667	2.33340		
M. A	Formal	163	4.6258	2.03923	-.973	.081
M.A	Non-Formal	135	4.8481	1.86911		
M. C	Formal	163	10.4632	2.20798	1.282	.529
M. C	Non-Formal	135	10.1037	2.63380		
M. A	Formal	163	5.2515	2.49281	-1.581	.500
M. A	Non-Formal	135	5.7259	2.67989		

E=English, U=Urdu, M=Math, K=Knowledge, C=Comprehension, A=Application

In comparing formal and non-formal students in cognitive abilities of English knowledge level, English comprehension level, English application level, Urdu knowledge level and Urdu comprehension level, we find that there are significant differences in the means. While in Urdu application level, Math knowledge level, Math comprehension level and Math application level English, there are no significant differences in formal and non-formal students. Comparing formal and non-formal students, means of English knowledge level, Urdu knowledge level, are slightly higher in case of formal students than those of their non-formal counterparts, while means of English comprehension level, English application level and Urdu comprehension level, are higher in case of non-formal students than their formal counterparts.

Level	Gender	N	Mean	St. D	T	Sig.
E. K	Boy	166	9.0422	3.57958	-4.932	.053
E. K	Girl	132	11.0265	3.27978		
E. C	Boy	166	6.5783	2.72695	-7.263	.000
E. C	Girl	132	8.4280	1.62769		
E. A	Boy	166	3.7319	2.47205	-8.578	.218
E. A	Girl	132	6.0568	2.12280		
U. K	Boy	166	12.9060	3.98619	-4.825	.233
U. K	Girl	132	15.0492	3.57037		
U. C	Boy	166	8.6139	1.81569	-6.931	.000
U. C	Girl	132	9.6970	.77597		
U. A	Boy	166	6.3916	2.74309	-5.116	.000
U. A	Girl	132	7.7841	1.94798		
M. K	Boy	166	4.6506	2.08637	-.748	.131
M. K	Girl	132	4.8220	1.80133		
M. C	Boy	166	10.0783	2.70743	-1.854	.008
M. C	Girl	132	10.5795	1.95545		
M. A	Boy	166	4.9970	2.66657	-3.634	.013
M. A	Girl	132	6.0568	2.36033		

Table 3: *Scores in cognitive abilities (Boys vs Girls)*

E=English, U=Urdu, M=Math, K=Knowledge, C=Comprehension, A=Application

In comparing male and female students from both formal and non-formal set ups, we find that there are significant differences across gender in all cognitive abilities of all subjects. As to the effect size, we find that there is small effect size in Math comprehension level and very small effect size in Math knowledge level. However, there are moderate effect sizes in English knowledge level, Urdu knowledge level, Urdu application level and Math application level. Large effect sizes have been observed in English comprehension level and Urdu comprehension level; while effect size in English application level has been very large. Considering means of different subjects, gender wise, we see that female students performed better in all cognitive abilities in all the three subjects of English, Urdu and Math.

CONCLUSIONS

It has been established in this study that there are significant differences in means of performance scores in formal and non-formal students, in respect of cognitive abilities in the subjects of English and Urdu. However, no significant differences have been found in the

means of Math subject of formal and non-formal students. Among these means we see that performance of formal students in English and Urdu is better than that of non-formal students in the same areas. Performance of non-formal students in the area of English comprehension, English application and Urdu comprehension is better than that of formal students. Gender wise, there are significant differences in the means of scores in all levels of all subjects. It is noteworthy that girls have been better performers in all the three subjects of English, Urdu and Math and in all levels of knowledge, comprehension and application.

When we see availability of physical facilities in both the streams of education i.e. formal and non-formal, we are astonished at the encouraging output of non-formal students. In formal schools there are highly qualified teachers with sound salary and job protection; spacious classrooms and playgrounds; availability of clean drinking water, toilets, electricity, security guard; excess of teaching learning materials etc. in formal setup, teachers are low qualified with low salary and job satisfaction; congested classroom in most cases with no playground; teacher teaching all students of all grades from nursery to V and resultantly imparting little time to individual student. In the scenario of such huge differences in facilities, literacy centers of Punjab are really doing good job. From the financial point of view, students of literacy centers are costing much less capital to the government of the Punjab than students of formal schools. Literacy centers are catering the needs of out of school children, especially where there is no formal school in neighborhood.

SUGGESTIONS/RECOMMENDATIONS

In the light of above mentioned conclusions, I would suggest the following recommendations: Multi-grade system of teaching should be promoted in the whole of country, especially where there is no facility of formal school. Teachers of literacy centers should be trained professionally and academically to get further good results. Better physical facilities should be provided to literacy centers. Salary of literacy teachers should be enhanced to secure teacher dedication more. Multi-grade teaching should be given suitable representation in national education policy.

REFERENCES

Ajao, A. (2001) Teachers effectiveness on students' academic performance. *Journal of Education and Practice* 5 (22)

Birch, I., & Lally, M. (1995). *Multigrade teaching in primary schools*. London: UNESCO Principal Regional Office for Asia and the Pacific.

Cattell, R. B. (1987). *Intelligence: Its structure, growth and action* (Vol. 35). Elsevier.

Checchi, D., & De Paola, M. (2018). The effect of multigrade classes on cognitive and non cognitive skills: Causal evidence exploiting minimum class size rules in Italy. *Economics of Education Review*. *10* (2). 78-98.

Chelule, E. (2014). Impediments to Implementation of Peace Education in Public Universities In Kenya. *Journal of Humanities and Social Sciences*, *6*(1), 174-185.

Chuma, P. C. (2012). Challenges Affecting Teaching-Learning in Primary Schools in Kenya. A case study of Central Division Mandera East District Executive Med Project, Moi University.

Heyneman, S. & Loxley, W. A. (1983). "The Effect of Primary School Quality on Academic Achievement across 29 High and Low income Countries." *In the American Journal of Sociology,* 188 (6), 1162-1194.

Kadivar, P., Nejad, S. N., & Emamzade, Z. M. (2005). Effectiveness of multi-grade classes: Cooperative learning as a key element of success. *World Academy of Science, Engineering and Technology, (8)*.

Lave, J. & E. Wenger (1991). *Situated Learning*, Cambridge University Press, New York.

Little, A. W. (Ed.). (2006). *Education for all and multigrade teaching: Challenges and opportunities*. Netherland: Springer Science & Business Media.

Merriam, S. B., & Caffarella, R. S. (1999). *Learning in adulthood: A comprehensive guide.* (2nd ed.). San Francisco, CA: Jossey-Bass.

Miller, B. D. (2008). Cattell-Horn-Carroll (CHC) theory-based assessment with deaf and hard of hearing children in the school setting. *American Annals of the Deaf*, *152*(5), 459-466.

Mulkeen, A., & Higgins, C. (2009). *Multigrade Teaching in Sub-Saharan Africa: Lessons from Uganda, Senegal, and the Gambia*. The World Bank.

Veenman, S. (1995). Cognitive and noncognitive effects of multigrade and multi-age classes: A best-evidence synthesis. *Review of Educational Research*, *65*(4), 319-381.

von Glaserfeld, E. (1984). An introduction to radical constructivism. In P. Watzlawick, *The Invented Reality*, New York: W.W. Norton & Company.