Enhancing initial teacher education approaches to teaching mathematics in high-poverty contexts: Can we stop reproducing inequalities?

Nejla Tugcem Sahin

University of Aberdeen

This paper is from the pilot phase of a larger PhD study which aims to explore and develop student teachers' views of social reproduction through mathematics education, within the framework of Bourdieu's theory of social reproduction and Freire's critical pedagogy. The pilot study developed workshop activities to explore and improve student teachers' views on social reproduction promoting practices. Initial analysis of the findings revealed that the participants might, unknowingly, promote social reproduction in their teaching practice. However, some change in their views have been identified in the post-workshop data. These tentative findings suggest that there may be merit in further investigation of the value of engaging student teachers in such activities to better prepare them to support economically disadvantaged learners in school mathematics.

Key Words: Child poverty; mathematics education; social reproduction; critical pedagogy; initial teacher education

Literature Review

In Scotland 19 percent of children have been identified as living in relative poverty according to the national statistical data from 2015/2016, and this percentage increases to 26 percent when family income and housing costs are accounted for (Scottish Government, 2017). Additionally, not only in Scotland but in many other contexts, economically disadvantaged children are more likely to be marginalized throughout their school life compared to their better off peers. In the UK, children in poverty are often allocated to fixed ability groupings, being left to feel disrespected, being labelled as 'problematic' or 'attention deficit' (Smyth, Wrigley, & Mcinerney, 2018). In the US context, the needs of such children are ignored, even in the most progressive curriculum development processes (Weissglass, 2001). In the South African context, it has been observed that some teachers' classroom pedagogies contribute to the reproduction of social inequalities (Hoadley, 2007).

Family background and the economic status of parents are the important determinants of their children's educational outcomes and their future income. (Björklund & Salvanes, 2011; Bloome, Dyer, & Zhou, 2018). According to recent work of Bloome, Dyer, and Zhou (2018), in the last 20 years, in the U.S., the correlation between income of parents and their children declined insignificantly, meaning that there still is a strong association between income across different generations and a limited intergenerational mobility. The intergenerational mobility is "the degree of fluidity between the socio-economic status of parents (usually measured by income and social class) and the socio-economic outcomes of their children as adults" (Blanden, Gregg, & Macmillan, 2007, p.43). Bloome, et al. (2018) suggest that education contributes to the intergenerational income persistence through educational inequality (the strong possibility that highly educated young people are

from higher-income families) and educational returns (better chances of getting a highly-paid job as well-educated adults compared to their less educated peers).

Bourdieu views education systems as "one of the fundamental agencies of the maintenance of the social order" (Bourdieu, 1984, p. 387). Bourdieu and Passeron (1977) claim that high and middle-class children exchange their embodied dispositions - *habitus* - with academic qualifications and power through Pedagogic Action (PA) in school. For Bourdieu and Passeron (1977), PA refers to all types of education, either formal (i.e. at institutions) or informal (i.e. at home). *Habitus*, on the other hand, is "the internalized form of class condition and of conditioning it entails" (Bourdieu, 1984, p.101). Individuals from the same habitus can have similar ways of behaving and speaking, and can generate similar types of practices (Bourdieu, 1984).

Zevenbergen (2000) highlights that some pupils with a certain *habitus* have better access to mathematical classroom discourse and the modes of interaction between pupils and the teacher, "and hence have more […] access to the mathematics inherent in such communications" (p. 201). This might be because school mathematics has its own vocabulary, meanings of which might be very different in the academic context than in real life; for instance, "ruler, face, odd, prime […]" (Zevenbergen, 2000, p.205). Pupils with a certain *habitus* that enables them to be engaged in such vocabulary in advance, perhaps at home or at private lessons, might be favoured in school mathematics.

Teachers can, unknowingly, serve social reproduction through mathematics education if they expect their students to be exactly like them (i.e. to behave, speak and be motivated or engaged in the same way). According to Bourdieu and Passeron (1977), 'conscious aiming' is lacking when people generate their practices objectively regarding only their habitus (Cited in de Freitas and Zolkower, 2009). In this sense, teachers' classroom practices are driven by 'common sense' which represents dominated views of society. Bourdieu and Passeron (1977) state that all PA "seeks to reproduce cultural arbitrary of the dominant or of the dominant classes" (p.5). Here, the concept of 'arbitrary' is crucial to understand how social inequalities might be reproduced by teachers, unknowingly. As de Freitas and Zolkower (2009) state, "pedagogy is a kind of symbolic violence, which functions to serve in reproducing class dominance if its arbitrary nature goes unrecognised" (p.190). Therefore, it becomes important for teachers to become critically conscious of their decisions related to their classroom practice and such decisions should be based on justifiable reasons, not be based on common sense.

Several studies have demonstrated that pre-service teachers hold deficit views about children living in poverty (Ladson-Billings, 2006; Thompson, McNicholl, & Menter, 2016). In a study carried out by Thompson, McNicholl, and Menter (2016), conducted in England, it was reported that student teachers mostly held the families responsible for the failure of children living in poverty instead of recognising the larger structural problems possibly having a great impact on the issue. In similar vein, Ladson-Billings (2006) argues that student teachers tend to oversimplify problems related to child poverty, blaming entirely students' family culture, race or ethnicity for their problematic behaviour or educational failure. According to Gorski (2012), "when people find themselves in contexts with which they are not familiar, their decision-making cognition defaults to intuition and stereotyped beliefs" (p.303), such as "poor people do not value education", "they are lazy" and so forth (p.308-311). If being poor is understood in a deficit way, teachers might develop low expectations for students from deprived backgrounds" (Gorski 2012, p.313), and this can lead to

negative attitudes which can be carried into their classroom practice (Weissglass, 2001).

The question then becomes how the teachers, who unknowingly perform social reproduction practices, can be made 'critically conscious' of their practice? As noted by Freire (1973, p.78), "critical consciousness is brought about not through an intellectual effort alone, but through *praxis*—through authentic union of action and reflection" (p.78). According to Ernest (1991), critical mathematics education can equip learners with essential intellectual tools to challenge the implicit intentions of education. Freire's notion of critical *praxis* necessitates two approaches: (i) education through meaningful and critical dialogue and (ii) problem posing education. A teacher's role, in this context, is to raise "problems to the learners regarding features of their lives. Both learners and teachers take part in a dialogue surrounding these problems […]" (Aubrey & Riley, 2016, p.132).

Methodology

For the purpose of the larger PhD study, a critical research design has been employed to explore alternative possibilities to initial teacher education to prepare student teachers to teach mathematics in high poverty settings.

Critical research explores alternative possibilities while understanding present practice and has three crucial stages in each research cycle: (1) the *current* situation—this is a problematic situation before the educational experiment occurs; (2)the *imagined* situation—this involves the process of imagining possible alternatives through e.g. reading, research, observation; and (3) the *arranged* situation—this is the process of putting an imagined situation into practice, and of creating a situation which is different than the ideal (imagined situation) due to the real life constraints (Skovsmose & Borba, 2004).

In the overarching PhD study, the fieldwork encompassed teacher educator interviews (understanding the *current* situation), qualitative and quantitative pre-workshop questionnaires (understanding the *current* situation), workshops for student teachers (*imagined* & *arranged* situation) and focus group interviews with the workshop participants ('new' *current* situation), and forms a cyclic process rather than a linear process. This paper will present a part of the pilot workshop data: from qualitative questionnaires (part of the *current* situation of the first research cycle) and the post-workshop focus group interview ('new' *current* situation of the first research cycle).

Four student teachers, at a Scottish University, attended the workshops. The first workshop was run with three student teachers and the second with one student teacher. The participants attended voluntarily and were provided with a questionnaire prior to the workshop. The questionnaire presented students with statements from various research findings which highlighted practices linked to social reproduction. The students were invited to respond to these statements using a five point Likert scale, and then to explain their responses.

The workshop was specifically designed to provide the necessary intellectual tools to challenge social reproduction promoting practices, while questioning, through dialogue, how socio-political structures might have an impact on teaching practices, and on what children growing up in poverty can or cannot achieve in school mathematics. During the workshop, the participants and I discussed our understandings of poverty, and how poverty might be understood by policy makers and school management (Activity1). Secondly, we questioned our aims for teaching

mathematics and located ourselves and policy makers on an adapted table of the aims of mathematics teaching (Ernest, 2000, p.6; Activity2). Next, we examined transcripts of examples of discourse between two different teachers and their pupils (activity adapted for a primary school context from the study conducted by de Freitas and Zolkower (2009)). The dialogue involved two teachers teaching the concept of commutativity in multiplication to primary school pupils (aged 7) in two different settings (Activity3). Finally, we discussed how engagement and engaging mathematical activities might have various meanings in different contexts. The students were then introduced to critical mathematics education with an activity centring on fuel poverty which was designed by the researcher (Activity4). Follow up data collection took place in the form of a focus group interview after the first workshop and an individual face-to-face semi-structured interview after the second workshop with the workshop participants.

Findings and discussion

The post-workshop questionnaire revealed two important sub-themes under the social reproduction theme: (i) symbolic violence through victim-blaming; and (ii) symbolic violence through non-recognition of the contextualized nature of school mathematics.

Student teachers tend to blame students living in poverty for their failure without considering socio-political structures. According to Schubert (2008), holding deficit views about individuals and blaming them "for their poor performance, is a form of symbolic violence through which social hierarchy is reproduced" (p.189). The following responses to the statement, "Students living in poverty might be excluded from the mathematical discourse in the classroom because of their lack of ability in academic communication." illustrate this point:

> ***Blue1***: "Not having enough exposure to numbers can make it tricky. (e.g. not shopping, no pocket money etc.)"
>
> ***Green2***: "They also might feel shut out from higher levels of maths activities due to their potential attainment gap with peers."

The participants strongly agreed with another statement, "Students living in poverty are more likely to be assigned to low ability groups if there is ability grouping in the school" and explained the reasons behind their decision as follows:

> ***Green1:*** I think they would, considering their previous knowledge might not be the same and motivation at home [due to] the lack of resources.
>
> ***Blue1:*** Scottish Government have noted a gap in attainment that is linked to poverty. Besides, coming to school hungry, emotionally deficient or sad can make it harder to learn.
>
> ***Green2:*** This statement feels true because of other research I have read about children from poverty backgrounds starting behind their peers.

The responses above are crucial to understanding how some political and academic discourse can shape the views of student teachers. Even in the primary school context, ability grouping seems to be normalized and/or unquestioned while it is often highlighted that progression of children growing up in poverty is hindered by the level that they started school and by their chaotic surroundings. This finding is consistent with that of Ladson-Billings (2006) in which she argues that student teachers tend to blame children themselves or their family culture for "why they cannot be successful with some students" (p.105).

Another statement in the questionnaire was, "Mathematics has its own vocabulary". While two participants stated that mathematics has its own vocabulary which students might not encounter in everyday life, others partially agreed to the statement and one of them explained his/her decision as:

> ***Blue1:*** While we use specific vocabulary in maths, these are often everyday vocabulary that pupils may be familiar with in other contexts. Sometimes, vocabulary may be changed to support understanding.

Such a view denies the fact that some pupils might be excluded from the mathematical classroom discourse due to their unfamiliarity with the specific mathematical vocabulary (Zevenbergen, 2000), and it may favour students from dominant social classes while maintaining the existing social class order.

Before the focus group interview, which took place after the workshop, the participants were given their questionnaire back to review their answers. After that, they were asked if they would change any of their answers. Their responses to this question provided an insight into the impact of the workshop on the student teachers' views of social reproduction practices. The following excerpt illustrates how participants have changed their views after the workshop.

> ***Blue 1:*** Well, there is one here that I would change. It is that the students living in poverty might be excluded because of their lack of ability in academic communication. And I did write that I agree. However, this appears to put the blame on the children, their lack of ability. I would change that because it is more about the way that the teacher communicates as oppose to their lack of ability. […] when we discussed the experiences that the student living in poverty would have and how that might be a barrier. […] The experience of fuel poverty, just making it something that they can relate to, […] teacher A and teacher B, how the differences in expectations and the type of pupils they had in their classroom and their approach, I just think if you take all into consideration it shows that […] you might teach them [pupils living in poverty] differently they cannot access it, it is not because of their lack of ability in academic communication.
>
> ***Red1*****:** […] I think it is really important that now seeing it like the way that teacher A used sets of, times and multiplied by. […] there is no reason why we should say no just because you [children in poverty] do not have an access to these words at home, I cannot teach you them. So, I think beginning with this mind-set, ok these children might not have a clue of what I am talking about, but it is important that I give them an access to these words.
>
> ***Green1:*** My mind is now even more open about what it means to teach in a [high] poverty area. […] Well, with all the examples that we saw, always keep high expectations for your students, because they live in a restricted area that does not mean that they have to think about themselves like that.

Transformative development of student teachers' views might not be completely achieved with a workshop. However, the designed workshop showed that it can be possible with creating environments for student teachers to critically question socio-political problems affecting mathematics learning/teaching through 'dialogue'.

References

Aubrey, K., & Riley, A. (2016). Oppression, freedom and critical approaches to education. In K. Aubrey, & A. Riley (Eds.), *Understanding & using educational theories* (pp. 127-140). London: SAGE.

Björklund, A., & Salvanes, K. (2011). Education and family background: Mechanisms and policies. In E. Hanushek, S. Machin, & L. Woessmann

(Eds.), *Handbook of the economics of education* (pp. 201-247). Amsterdam: Elsevier.

Blanden, J., Gregg, P., & Macmillan, L. (2007). Accounting for intergenerational income persistence: Noncognitive skills, ability and education. *The Economic Journal, 117*(519), 43-60.

Bloome, D., Dyer, S., & Zhou, X. (2018). Educational inequality, educational expansion, and intergenerational income persistence in the United States. *American Sociological Review, 83*(6), 1215-1253.

Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. Cambridge, Massachusetts: Harvard University Press.

Bourdieu, P., & Passeron, J. (1977). *Reproduction in education, society, and culture*. London: Sage.

de Freitas, E., & Zolkower, B. (2009). Using social semiotics to prepare mathematics teachers to teach for social justice. *Journal of Mathematics Teacher Education, 12*(3), 187-203.

Ernest, P. (1991). *The philosophy of mathematics education*. London: The Falmer Press.

Ernest, P. (2000). Why teach mathematics? In S. Bramall, & J. White (Eds.), *Why learn maths?* (pp. 1-14). London: London University Institute of Education.

Freire, P. (1973). *Pedagogy of the oppressed*. New York: Seabury Press.

Gorski, P. C. (2012). Perceiving the problem of poverty and schooling: Deconstructing the class stereotypes that mis-shape education practice and policy. *Equity & Excellence in Education, 45*(2), 302-319.

Hoadley, U. (2007). The reproduction of social class inequalities through mathematics pedagogies in South African primary schools. *Journal of Curriculum Studies, 39*(6), 679-706.

Ladson-Billings, G. (2006). It's not the culture of poverty, it's the poverty of culture: The problem with teacher education. *Anthropology & Education Quarterly, 37*(2), 104-109.

Schubert, J. (2008). Suffering/symbolic violence. In M. Grenfell (Ed.), *Pierre Bourdieu: Key concepts* (pp. 183-198). Stocksfield: Acumen.

Scottish Government. (2017). *Poverty and income inequality in Scotland: 2015/16*. Edinburgh: National Statistics.

Skovsmose, O., & Borba, M. (2004). Research methodology and critical mathematics education. In P. Valero, & R. Zevenbergen (Eds.), *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology* (pp. 207-226). Dordrecht: Kluwer.

Smyth, J., Wrigley, T., & Mcinerney, P. (2018). *Living on the edge: Rethinking poverty, class and schooling* (2nd ed.). New York: Peter Lang.

Thompson, I., McNicholl, J., & Menter, I. (2016). Student teachers' perceptions of poverty and educational achievement. *Oxford Review of Education, 42*(2), 214-229.

Weissglass, J. (2001). In focus... inequity in mathematics education: Questions for educators. *The Mathematics Educator, 12*(2), 34-39.

Zevenbergen, R. (2000). "Cracking the code" of mathematics classrooms: School success as a function of linguistic, social, and cultural background. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching & learning* (pp. 201-223). Westport: Greenwood Publishing Group.