Special Collection: Limitations and Possibilities of Justice in Education and the Implications for Sustainable Futures

RESEARCH ARTICLE

From experience to actions for justice: learners' views on epistemic, environmental and transitional justice in Nepal, Peru and Uganda

Robin Shields, robin.shields@uq.edu.au
University of Queensland, Australia

Ainur Muratkyzy, ainur.muratkyzy@bristol.ac.uk
University of Bristol, UK

Mohan Paudel, mohan@tucded.edu.np
Ashik Singh, ashiksingh413@gmail.com
Tribhuvan University, Nepal

Expedito Nuwategeka, nuwategeka@gmail.com
Gulu University, Uganda

María Fernanda Rodriguez, mrodriguez@grade.org.pe
University of Cambridge, UK/GRADE, Peru

Julia Paulson, julia.paulson@usask.ca
University of Saskatchewan, Canada

Understanding how today's children will act in the future is essential to education supporting sustainable development. This study investigated how students in three contexts in Nepal, Peru and Uganda understand environmental, epistemic and transitional justice. It used a tablet-based app to present students with scenarios that illustrates different attitudes, experiences and intended actions with respect to these three forms of justice and analysed responses to focus on factors related to intended actions. The analysis suggests that both attitudes and experiences are important in shaping intended actions in the future. Thus, education systems should not only develop attitudes to support sustainable development, but also exemplify and embody socially justice practices, providing students with experience of social contexts that support sustainable development.

Keywords social justice • education • sustainable development • technology

Key messages

- Intended actions related to environmental, epistemic and environmental justice are related to students' experiences and attitudes to justice.
- Scenarios on a tablet-based app are a useful way to study attitudes, experiences and intended actions.
- Responses to particular scenarios and questions varied across countries.

Introduction

Does learning about justice in school make a difference to how young people act? Does it matter if their own experiences are far from just? This paper presents methods and findings from one component of the larger JustEd project, in which a tablet-based app was used to explore students' views, attitudes, experiences and intended actions related to three aspects of social justice: environmental, epistemic and transitional justice. JustEd explores the connections between education and forms of justice in order to help understand the role of education as an enabler of justice related elements of the United Nations' Sustainable Development Goals (SDGs). In particular, JustEd is interested in the interrelationships between education and environment justice, epistemic justice and transitional justice and therefore focuses on connections between SDG 13 (climate action) and SDG 16 (peace, justice and strong institutions). The project explored these relationships in three countries – Nepal, Peru and Uganda – where there are ongoing environmental degradation and climate crisis (environmental injustices); persistent inequities and discrimination linked to ethnicity, religion, region and language, including in education (epistemic injustices); and legacies of armed conflict and violence. These have been addressed to varying degrees (transitional injustices). JustEd investigated these relationships in multiple ways, including through policy analysis, expert interviews, school observations, creative methods with young people, and a tablet-based app survey. This paper reports on the results of this survey. Specifically, it answers the question: how are learners' intended actions in respect to environmental, transitional and epistemic justice related to their attitudes to, experiences of and knowledge of justice in education?

The paper presents the methodology used to investigate this question, including the design of the app, the methods of data collection, and an analysis of the data. While this study is exploratory and not generalisable to the population level, analysis suggests that students' experiences of justice (and injustice) are particularly important in shaping their intended actions related to environmental, epistemic and transitional justice. The data allowed us to explore aspects of these relationships, including particular aspects of these variables as well as differences between and variation within the countries and regions studied.

Literature review: education and environmental, epistemic and transitional justice

This paper shares with the larger JustEd project an understanding of environmental, epistemic and transitional justice as connected to one another and constitutive of broader notions of social justice (Milligan et al, 2021). As the vast literature on social justice demonstrates, it is understood not only in terms of fairness of distribution, but includes representation and recognition of rights, identities and ways of knowing (for example, Fraser, 2000; Fricker, 2007; Sen, 2009; Novelli et al, 2017). Education is positioned as crucial within social justice agendas (for example, Zajda et al, 2006; Apple, 2009). It is a key method by which change is envisioned to happen, as goals of both structural change in terms of who is able to access and benefit from education and curricular change in terms of the values, messages and futures that education transmit position it as a transformative institution. Within the SDG agenda, education is also seen as crucial, with education–specific goals and with education is positioned as a key enabler to support the attainment of other goals and the SDG project as a whole (Bengtsson et al, 2018). While education is regularly viewed as a transformative institution and an enabler of social justice and other important agenda, considerable empirical and theoretical research document the ways in which education can reproduce and entrench inequality, discrimination, and injustice (for example, Bourdieu, 1986; Harber, 2004; Tannock, 2008; Mayo, 2014).

JustEd argues for particular importance of studying education and its connections to justice, as it is both a means to promote or achieve justice (that is, as it is taught both formally and informally and through its outcomes) as well as a space in which forms of justice and injustice are experienced by students and thereby form an important part of their socialisation. In order to better understand how education might enable or impede justice, the JustEd project sought to consider relationships between education and specific forms of justice. The body of research exploring education and social justice is large and well developed. Literature is also growing around education and its relation to each of the specific justices explored in JustEd; however, greater understanding of their interconnections is needed. Environmental justice is conceptualised in different ways in the literature, with foci varying between anthropocentric 'right to nature' approaches and ecocentric 'rights of nature' approaches (Nuwategeka et al, 2021). Environmental education efforts characterise both approaches, with education seen as essential for messages of environmental preservation and protection (for example, Stevenson et al, 2013) and some arguing for the total reconceptualisations of educational systems in order to respond to climate crisis (Common Worlds Collective, 2020). Epistemic justice is the response to epistemic violence, include the overt destruction of knowledge systems, languages and ways of the apprehending the world, or their implicit disavowal in powerful spaces, including the powerful spaces of educational systems, languages of instruction and curricula (for example, Fricker, 2007; Battiste, 2011; Balarin et al, 2021). There is a growing literature on education and epistemic justice, documenting the ways in which education continues to perpetuate epistemic injustices as well as proposing how, through systemic, curricular and relational change, epistemic justice might be fostered in education (for example, Kotzee, 2017; Walker, 2019). Transitional justice encompasses processes for acknowledging, uncovering truth about, providing accountability for, commemorating, and repairing the legacies of periods of massive human rights violations (for example, Palmer et al, 2012; ICTJ, 2024). A growing body

of research explores how education can support and contribute towards transitional justice, while at once being a space in which the reckoning and repair of transitional justice is often required (for example, Bellino et al, 2017; Davies, 2017).

JustEd contributes to these growing literatures by exploring how environmental, epistemic and transitional justice as interconnected elements of social justice in theoretical and empirical ways across the three country contexts. Importantly, existing research is largely case study–based, without strong quantitative elements, and tends to be focused on single country studies and/or studies that explore a single form of justice or social justice broadly. JustEd's approach to interconnections across three areas of justice and its empirical, mixed–methods reach across three countries make it unique. Specifically, this component of the project seeks to understand correlates of intended action related to environmental, epistemic and transitional justice. There exists a long-standing substantial body of literature examining correlates and predictors of actions and behaviours related to environmental justice (Asch and Shore, 1975); however, there is not clear evidence on whether educational interventions lead to long-term behaviour change and, if so, how (Gralton et al, 2004). This finding entails that education alone may have limited potential as an intervention to further environmental sustainability. For example, Kahan et al (2012) find that scientific literacy has little or no relationship to how adults perceive the risks associated with climate change. Furthermore, literature on education and environmental actions and behaviours does often not consider differences in how individuals understand the natural world, particularly the distinction between anthropocentric and ecocentric approaches (Nuwategeka et al, 2021), nor distinctions of how burdens and responsibilities should be shared (Caney, 2014). The literature exploring correlates and predictors of actions and behaviours related to epistemic and transitional justice is much more limited.

Methodology

Building upon the qualitative work conducted in JustEd, this study investigated the relationships between attitudes, knowledge and intended actions related to epistemic, environmental and transitional justice among a wider set of participants in order to generate insights with wider relevance. It did so using a tablet-based app through which research participants generated quantitative data of their experience, attitudes, knowledge and intended actions related to these forms of justice. While exploratory in nature, the data and analysis reveal insights into key correlates of intended actions as well as cross–national and subnational variations and nuances.

App design

In order to investigate the elusive concepts of intended action and socially situated attitudes towards justice, we used a tablet-based app that presented research participants with a series of vignettes and asked their views and how they would respond. This approach was based on the belief that both intended actions and attitudes can best be understood in context-rich situations. For example, the following scenario illustrates various aspects of environmental and epistemic justice (see Figure 1). It starts:

> A cement factory has opened in the Tinbesi village. As part of this process, the owners of the factory have met with the local government, and described the

Figure 1: App artwork illustrating the cement factory in the scenario
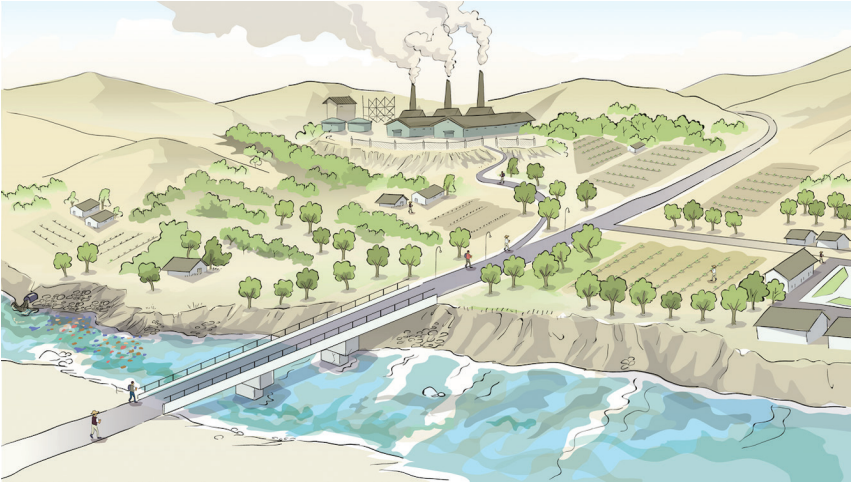
benefits of the factory, including jobs for people in the area. However, people were concerned that the factory would pollute the air and also discharge waste in the river, the main water supply in Tinbesi village and down streams. The river is recognized for its vast diversity of wildlife.

Participants were asked to rate agreement with the following statements, which examine how they understand the environment versus both as a resource to be conserved and the intrinsic rights of the natural world:

- The local population should not lose jobs just because of air/river pollution.
- The wildlife in the river have rights to survive and thrive. They should not be sacrificed for factories that meet human needs.
- The local government has a responsibility to protect the environment. It should only allow the factory to operate if it protects the environment and river, even if this means losing the factory.

The story then continues (see Figure 2):

Before the factory was constructed, the land on which it sits was believed to be sacred by most inhabitants of Tinbesi. It was not used for agriculture, and no one lived there, but it was used for religious ceremonies. The land was sold to the factory owners by the government. At the time it was sold, members of the village protested the construction of the factory by blockading the road.

The following statement, to which participants were asked to rate agreement, shifts the focus to the status and legitimacy of alternative ways of knowing, a key component of epistemic justice:

- The use of the land for the factory is more important than the traditional use of the land.

Figure 2: App artwork illustrating the religious ceremonies and protests in the scenario

The scenario then continues by asking participants to consider how they would respond, thereby shifting the focus to *intended action*.

> Now imagine that something like this is happening in your community. A natural environment that you know of – a forest or a lake or wild land – is being affected by a developer who wants to turn it into an industrial compound or a housing development or build a road. What would you do?

Students were asked to rate their agreement with the following statements in relation to their own intended actions:

- I would support the project, I believe this sort of business and construction would bring development and prosperity to my community.
- I would organise a peaceful protest with other students and teachers at my school who love the river/forest/land and don't want to see it destroyed.
- I would consider doing something in the future, but at the moment the environment is not a priority for me and my family.

Scenarios were adapted for each country/context in the study, including locally representative artwork, names and other details that would be relevant to the context. Vignettes and items were translated by the team in each country, with peer-review and piloting used (but not reverse translated into English) used to ensure accuracy in the translation. Students were given the options to complete the survey in a language with which they were comfortable as follows: English or Nepali in Nepal, Spanish only in Peru, and English or Luo in Uganda.

Responses included slider ratings of agreement/disagreement and multiple-choice responses. The app also played audio recordings of each scenario/vignette, in order to minimise the barriers that different literacy abilities might pose in understanding participants' views. In total, three scenarios with 22 response items were presented in the app.

In addition to scenario-based questions, the app included several items related to attitudes and experiences that were not based on scenarios, to which participants responded to a statement with an agree/disagree slider, for example:

- The country where I live is a place where justice is served.
- The curriculum should support students to learn about indigenous knowledge and stories.
- Environmental damage has negative impacts on me and my family.

Additionally, the app asked participants about basic demographic information such as their gender, language spoken at home, and possessions in the household as a basic measure of socio-economic status. Responses for all of these items were adapted based on the context of study. Finally, the app asked several questions that studied participants' knowledge of curriculum content related to environmental, epistemic and transitional justice. These knowledge questions were developed based on the curriculum of each country/context, and both the questions and responses varied across contexts.

Sampling, data collection and ethics

Data collection took place in schools, with research teams using a set of tablets to collect data from secondary school children in each of the three countries/contexts. In each country/context a school sampling strategy was devised that assured a statistically representative sample of different school types and relevant regions or urban/rural contexts. This was achieved by defining sampling strata relevant to the context that ensured schools represented a range of school-level characteristics (for example, public and private schools, rural and urban schools) and randomly selecting schools within the strata. Within each school, representativeness was achieved by inviting all students to participate in the study. The sampling design thus used stratified random sampling to achieve a good representation of diversity across schools and diversity within schools.

However, because the overall population characteristics for demographic variables were not well known (mainly because these regions were defined based on interest for the study rather than administrative boundaries), it was not possible to achieve calculate sampling weights or to statistically assess the representativeness of the sample. An assumption in our analysis was therefore that students within the region have equal probability of being invited to participate in the study. In addition, it is important to note that the grade level(s) and corresponding ages varied slightly between countries due to requirements for exams and associated pressures on classroom time for participation.

Before starting the app, participants were informed of their rights, the use of data for research purposes, and gave informed consent to participate. Ethical oversight was provided by the University of Bath's Social Sciences Research Ethics Committee.

Data set

The full data set contains 4,323 responses from a total of 92 schools. Data were cleaned to include only complete responses (those that answered all questions) and

also to discard those who did not move the slider from the midpoint for more than 20 questions, and other outliers and erroneous responses were also removed. After processing, 4,142 responses were used in the final analysis.

Method of analysis

Our analysis focused on how intended action relates to experience, attitude and knowledge of justice among research participants in the three countries, while also considering demographic and social background. To this end, we used confirmatory factor analysis (CFA) to construct scales of intended action, experience, attitude and knowledge with respect to environmental, epistemic and environmental justice, as well as a scale of socio-economic status based on household possessions. Scaling was performed independently for each scale in each country, meaning that the factor loadings and scores were not comparable *across* countries but also ensuring construct validity *within* each country. Each scale combined items related to all three justices (environmental, epistemic and transitional): this was because many items combined multiple justices (for example, the scenario described earlier combines environmental and epistemic justice) and because there were not enough items related to a single justice (epistemic, environmental, transitional) and domain (intended action, attitude, experience, knowledge) to produce a reliable fit.

The scales computed in the CFA were then used in a multilevel regression model, in which intended action was the dependent variable. This model enables investigation of how the independent variables are related to change in intended action. The multilevel approach takes into account the clustered nature of the sample (that is, students were samples within schools) and allows investigation of school-level variables (for example, public/private schools) and variation between schools. Additionally, we examine differences of key items and correlations between particular items within countries.

Results

Descriptive analysis

Key information on the sample and respondent demographics is provided in Table 1. Results show that the samples are broadly comparable across contexts in terms of age and gender, and the number of respondents and schools. Furthermore, in all contexts there is a dominant first language – Nepali, Castellano (Spanish) or Luo – but a sizeable number of minority languages. To simplify our analyses, we dichotomise variables for language and gender. Language is coded as 'minority language', which is 0 for all those who spoke the dominant language (that is, that with the highest number of speakers) and 1 for all others, while gender is coded as 'Man', which is 1 for all who answered 'Boy/Man' and zero for all others. This dichotomisation was undertaken because the number of respondents in some gender and language groups was too small to facilitate analysis (the margins of error for these groups would have been very large due to the small number of respondents), but this coding should not be taken to negate the importance of these groups and their relevance to social justice more broadly.

The items corresponding to the three scenarios, were linked to attitudes, experiences and intended actions. A summary of items, their means across the three contexts, and their mapping to scales is provided in Table 2. This table also shows

Table 1: Summary of sample and demographic variables

	Nepal	**Peru**	**Uganda**
Gender			
Girl/Woman	55.4%	48.0%	47.0%
Boy/Man	44.4%	49.8%	52.5%
Nonbinary/Transgender	0.2%	0.4%	0.4%
Other/Not Stated	0.1%	1.8%	0.1%
Mean Age	15.2 (1.1)	15.7 (0.7)	16.6 (1.5)
Language	Maithali 33.8% Nepali 45.4% Newari 2.5% Other 4.1% Tamang 14.2%	Castellano 91.7% Other 1.0% Quechua 5.9% Shipibo 1.4%	Ateso 0.4% Bantu language 1.1% Dinka 0.6% English 11.6% Kiswahili 0.2% Luo 85.1% Madi 1.0%
Schools	32	33	28
Respondents (N)	1,560	1,301	1,281

Note: For age, standard deviation is shown in parentheses.

some differences across countries: for example, students in Uganda were much less likely to agree that students at school should be able to speak the language they speak at home (Experience item 2). Correct answers to knowledge-based questions are also broadly similar across countries, and it is important to keep in mind that these questions were different, based on the curriculum in each context. Based on these mappings, scales were created using CFA. In addition, CFA was undertaken for socio-economic status (using household possessions) and knowledge related to environmental, epistemic and transitional justice.

CFA models were fit successfully, with comparative fit indices (CFI), ranging from 0.604 to 1.000, with an average of 0.868. While marginally lower than recommended levels of 0.9 for a good fit (Bentler, 1990; Hair et al, 2010; Zainudin, 2012), it was deemed acceptable given that these are newly developed constructs being measured across multiple social and cultural contexts. Further refinement and development of these scales could be a fruitful area for future research.

The CFA models were also used to extract scores, which used the CFA loadings and slider responses to produce a composite measurement of where each individual research participant is placed on each scale (intended action, attitude, experience, knowledge and socio-economic status). Because CFA was undertaken separately for each country, scores on these scales are not comparable across countries, but they represent a robust measure of the concepts being analysed that uses the unique information provided by each slider response. These scales were used in the multilevel regression below, but we first examined correlations between them (Table 3).

Correlations show that strong relationships exist between these variables, and that they are quite consistent across countries. Specifically, intended action is most strongly related to attitudes, and then to experiences. Similarly, experience and attitudes are also related to one another. Because the independent variables (experience of justice, attitudes to justice and knowledge of justice) are correlated with one another, an integrated model is required that relates these variables to intended action, independently of their associations with one another. We use multilevel regression to disaggregate and simplify these complex relationships.

Table 2: Summary of items used with slider response scales

Item summary	Nepal	Peru	Uganda
Experience			
My classmates express their opinions even when they are different from others	75.5	74.4	81.3
Classmates feel free to use the language they speak at home	70.6	72.4	35.5
Students can summarise social, political and environmental lessons in their own words	69.8	64.5	82.4
My school is a place where I feel safe	84.1	75.0	86.0
My school uses natural resources responsibly	76.4	69.2	87.7
Students are treated fairly by other students	67.2	67.9	64.7
My home is a place where I feel safe	92.4	81.7	88.1
Adults take my opinions and ideas seriously	68.8	65.3	81.2
Attitude			
The curriculum should include indigenous knowledge/stories	85.8	84.7	89.5
Students should learn about the ongoing impact of past conflicts or violence	80.8	85.3	89.8
Children have a right to learn in their mother tongue	79.4	83.8	79.4
Government should provide education in minority languages	73.9	78.4	85.8
The curriculum should teach about a past conflict[*]	80.1	76.0	90.1
People affected by a conflict deserve an official account from the government[*]	76.4	87.9	91.5
Those affected by the conflict should receive compensation[*]	79.9	64.8	90.7
Wildlife have rights to survive and should not be sacrificed for human needs[*]	76.2	84.3	78.3
The government should only let a factory operate if it protects the environment, even if this means closing it[*]	80.5	83.3	87.4
Intended action			
Protesters are against environmental damage is justified[*]	73.6	77.8	68.4
Would approach teachers to learn about a past conflict[*]	83.0	80.0	87.8
I would contact an organisation of mothers of missing children and volunteer to help[*]	88.0	79.0	92.8
I would organise a peaceful protest for the environment[*]	84.3	78.9	88.4
I would consider doing something in the future, but now the environment is not a priority[*](-)	61.9	34.4	48.2
Include minority language as subject for all to learn[*]	2.3	2.3	2.4
Agree that minority language students have a right to learn in their mother tongue[*]	1.5	1.3	1.4
Support parent arguing for indigenous knowledge in school[*]	1.6	1.5	1.6
Knowledge			
Items correct (%)	48.1	44.5	57.1

Notes:
* item was presented in the context of scenario.
(-) the item is negatively loaded.

Multilevel regression model

This analysis seeks to answer the question 'how are learners' intended actions in respect to SDGs 13 and 16 related to their knowledge of, attitudes to and experiences

Table 3: Pearson correlation coefficients between intended action, attitudes, experiences and knowledge as calculated using confirmatory factor analysis for Nepal, Peru and Uganda

Nepal				
	Attitudes	**Experience**	**Intended action**	**Knowledge**
Attitudes	1			
Experience	0.342***	1		
Intended action	0.497***	0.214***	1	
Knowledge.	0.047	−0.100***	0.084***	1
Peru				
Attitudes	1			
Experience	0.465***	1		
Intended action	0.637***	0.344***	1	
Knowledge	0.189***	−0.012	0.095***	1
Uganda				
Attitudes	1			
Experience	0.359***	1		
Intended action	0.515***	0.309***	1	
Knowledge	0.063*	−0.022	0.085**	1

*Note: *p* < .05, **p* < .01, ***p* < .001.*

of different forms of justice in education?' To answer this question, we undertook a multilevel regression analysis in which intended action (as defined using the items in Table 2) was modelled as an outcome of attitudes, experiences and knowledge as well as relevant social and demographic variables (socio-economic status, gender, minority language status). The multilevel design used random intercepts for schools to account for the clustered nature of the sampling (that is, students were sampled within schools and are therefore not completely independent observations), a well-established technique for handling clustered data (Lee et al, 2006; Goldstein, 2011). This multilevel approach also allowed us to include private schooling as a school–level variable.

Results show that both attitudes and experiences are significantly related to students' intended actions with respect to environmental, epistemic and transitional justice (Table 4). Since both attitudes and experiences are measured using a standardised scaling (that is, a Z-score with a mean of approximately 0 and standard deviation of approximately 1), it appears that the magnitude of the association with experiences is strongest. However, both attitudes and experiences are highly significant, and this relationship is consistent across all countries. However, knowledge is significantly related to intended actions in two of the three countries, and the magnitude of the relationship is not very large. This result could be attributed to the limited measure of knowledge undertaken in the app (that is, only a few questions were asked), but it does point to some uncertainty related to the importance of knowledge vis-à-vis other factors such as experience.

In contrast, demographic and social background variables do not have such consistent relationships to intended actions. Males seem less likely to take action to support the SDGs in two of three countries, highlighting the importance of progressive gender norms and socialisation processes in achieving development goals. However, socio-economic status and minority language status do not have a consistent association across the countries studied.

Table 4: Results of the multilevel regression analyses for each country's data set

	Intended action		
	Nepal	**Peru**	**Uganda**
Constant	−0.001 (0.043)	0.149*** (0.035)	0.091*** (0.031)
Attitude	0.406*** (0.021)	0.571*** (0.023)	0.428*** (0.024)
Experience	0.084*** (0.021)	0.080*** (0.023)	0.138*** (0.024)
Knowledge	0.066* (0.028)	−0.009 (0.025)	0.063* (0.026)
Socio-economic status	−0.044 (0.024)	−0.048* (0.024)	0.026 (0.024)
Gender: (*ref. Female*)			
Male	0.004 (0.031)	−0.222*** (0.037)	−0.113*** (0.036)
First language: (*ref. Majority language*)			
Minority language	−0.065 (0.034)	−0.022 (0.069)	0.027 (0.050)
School type: (*ref. Public*)			
Private	0.129* (0.064)	−0.113* (0.054)	−0.068 (0.037)
Groups	31	32	28
Std. Dev. Random Intercepts	0.113	0.046	0.000
Observations	1,535	1,293	1,191

Note: *$p < .05$, **$p < .01$, ***$p < .001$

While this is an exploratory study, these results suggest that effective interventions to promote SDGs within schools should focus beyond content-based learning outcomes (that is, knowledge) to cultivate relevant attitudes and also provide students with a learning experience that is consistent with and reflects the notions of justice and fairness that underpin the goals. Its results can be interpreted with some optimism, given that the strongest correlates of intended action (that is, attitudes and experiences) are amenable to intervention rather than fixed demographic characteristics.

While a multilevel model is the correct approach to clustered data, our results also show that between school variance is relatively low. The standard deviation of school intercepts is low generally, but highest in Nepal (0.113), where it still only accounts for only 5 per cent of the overall variance, meaning that most variation is between students rather than schools.

Variations within and across countries

In addition to these cross-country findings, data generated through the study also reveal the complexities and nuances of each context. For example, in Peru, there is evidence that gender is closely related to perceptions of fairness and safety. More students who identified as nonbinary/transgender feel students do not treat each other fairly than do other respondents (47 per cent vs 67 per cent), and they further reported feeling less safe at home (60 per cent vs 80 per cent) and at school (55 per cent vs 75 per cent).

The data also highlight the importance of language in Uganda, where students had higher averages for their classroom experiences in terms of freely expressing their opinions and students' ability to summarise key social, political and environmental issues (more than 80 per cent against 60–70 per cent in Nepal and Peru); however, they had an average of 35.5 per cent for feeling free to speak in the language they

speak at home compared to their Peruvian and Nepalese peers (72.4 per cent and 70.7 per cent, respectively).

In Nepal, the results show key distinctions between public and private schools, which is evident in responses to the statement 'my life and that of others in my family has been fair', as the mean response among private school participants was 81.5 per cent versus 70.1 per cent in public schools. This was also evident in the language in which students chose to complete the survey: those who opted for English had a mean response of 81.1 per cent versus 63.4 per cent of those who used Nepali, reflecting the advantages that have been associated with English language education in Nepal (Caddell, 2007). Table 5 also shows that differences between public and private schools are evident in other ways in which students experience fairness in their lives.

However, it is also difficult to draw definitive conclusions from cross–country comparisons. The differences we observed could be due to the translation of scenarios and question wordings or because the sampling and data collection methods varied across each context (that is, the strata used in sampling and the age of students participating) in the study rather than differences in the population. Nevertheless, these findings provide some indications and motivations for further in–depth study and analysis.

Discussion and conclusion

While this is an exploratory study, results point to a particularly strong and consistent relationship with students' attitudes to and experiences of social justice and their intended actions with respect to SDGs 13 and 16. In our regression analysis, these two factors are most consistently related to students' intended actions with respect to environmental, epistemic and transitional justice, as measured through their responses to hypothetical scenarios presented in the app.

In addition to these findings, this component of the JustEd project demonstrates how mobile and tablet technologies may be used to study research topics related to social justice and fairness. In particular, we used these technologies to present scenarios that provide a context in which to investigate attitudes and intended actions. These socially situated responses are arguably more representative of underlying views than other methods (for example, decontextualised attitudinal questions on a survey questionnaire), and the illustrations and narrations provide additional context to responses and help to overcome issues associated reading comprehension, which could bias analysis significantly.

There are also important limitations to our study. Foremost, our mapping of questions on the scenarios to the constructs of attitudes, experiences and intended actions is somewhat subjective: other mappings might be possible, and a full analysis of these constructs is not provided here. Furthermore, many other analyses of the questions and scenarios presented in the app are possible; the analysis presented in

Table 5: Differences between public and private schools in Nepal for individual items on the app survey (percentages)

	N	My school is a place where I feel safe	My school uses natural resources responsibly	All students are treated fairly by other students
Public	1,102	87.0	79.7	72.0
Private	457	76.9	68.3	55.8

this paper should not be considered the sole and definitive analysis of these data, but rather one way in which they may be used to answer a research question. Finally, our measurement of knowledge related to these concepts is very limited, comprising only a few questions on the app. This makes it difficult to distinguish fine-grained levels of knowledge, which indeed is a key concern of much research on educational assessment. Instead, we consider knowledge mainly as a personal quality or characteristic and examine how it is likely to be related to intended actions.

In addition to these limitations, it is important to keep in mind that this is only one possible analysis of these data, and many additional or complementary analyses are possible. Such analyses might look in greater detail at individual items or issues that hold particular relevance in national contexts or focus more upon the ways in which these diverse contexts differ from one another. Both of these would be fruitful avenues for further research. Future research could also examine the constructs defined in our study in greater depth and with greater precision. Future research could also use the app in different contexts and expand the data set available for analysis.

A related area of enquiry would be to examine the measurement invariance of these constructs (Rutkowski and Svetina, 2014), in other words whether the attitudes, experiences and intended actions can be said to mean the same thing across different country contexts. Indeed, given evidence that common symbols – such as school itself – takes on meaningfully different meanings across contexts (Anderson–Levitt, 2003), it is necessary to question the ways in which the concepts we are studying, that is, different forms of justice, have different meanings across contexts. This could be explored drawing by working with the scenarios and the accompanying data set in a qualitative way with learners in each context.

Notwithstanding these limitations, our study presents important evidence of how students' learning environments and experiences are likely to be important in shaping their future actions. Particularly, they warn against narrow or technical approaches to education for sustainable development that focus on content delivery, as they suggest that content knowledge alone is unlikely to be successful in shaping future actions that align with the SDGs. Instead, careful attention is required to creating educational environments, relationships and practices that embody and reflect the forms of justice that underpin key SDGs (that is, environmental, epistemic and transitional justice). Ensuring that educational environments are themselves just spaces where learners can see justice being modelled and enacted appears to be a key priority for education's enabling potential. It seems that when we consider education as an approach to supporting sustainable development in other areas, the best approach is to teach by example.

Conflict of interest
The authors declare that there is no conflict of interest.

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