

Can student populations in developing countries be reached by online surveys?

The case of the National Service Scheme Survey (N3S) in Ghana

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Abstract

This paper tackles the question whether it is a viable strategy to conduct online surveys among university students in developing countries. By documenting the methodology of the National Service Scheme Survey (N3S) conducted in Ghana, we set out to answer three concrete questions: (1) How can a sample of university students be obtained? (2) How can students be motivated to cooperate in online surveys? (3) What kind of devices do students use for completing an online survey?

Our results indicate that online strategies can be very useful to reach this particular target group, at least if the necessary precautions are taken. Our research strategy consists of the following elements: offline recruitment of students by means of a short in-class survey, the combination of email and text-message invitations and the use of mobile phone credit as a quasi-cash incentive.

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1. Introduction

Over the last decade, surveys have become an increasingly prevalent tool of observation in developing countries, providing the academic community as well as policy makers with crucial information on the socio-economic situation, living conditions and health issues of populations. While the importance of surveys in developing countries is growing, survey researchers in these countries are –due to specific economic, political and cultural factors- confronted with a series of pressing methodological and practical challenges (see Bulmer and Warwick 2001; Survey Research Center 2010). Because a central registry of the population is often non-existent, of poor quality or not accessible, random sampling procedures are usually not feasible (Bulmer 2001). Lacking infrastructure increases traveling times for interviewers and makes it difficult to reach respondents via the Internet. Furthermore, it is unclear whether methodological knowledge that was developed in a Western context can simply be transposed to developing countries. Besides these challenges, the specific situation of these countries also provides opportunities for survey researchers. The survey climate (i.e. the societal-level factors that contribute to the willingness to participate in surveys; Groves and Couper 1998: 155), for example, may be better given that respondents in developing countries are not overburdened with surveys to the same degree as respondents in the West. A recent telephone survey among the Rwandan population, for example, showed a great willingness to cooperate (Blumenstock & Eagle 2012).

This paper contributes to the methodological and practical knowledge concerning the conduct of surveys in developing countries. We propose a concrete methodology to conduct *online* surveys among university students. University students are a highly particular subgroup of the population in terms of educational background, financial resources, mobility and access to new technologies. Today's students are tomorrow's societal elites, making this subgroup an extremely interesting subject of study (see also the literature on Graduate Destination Surveys; Schomburg and Teichler 2006; du Toit et al. 2014).

But is it a viable strategy to survey university students in developing countries by means of online survey? This broad question hinges on three sub-questions: (1) How can a sample of university students be obtained? (2) Are students willing to cooperate in online surveys, and how can this willingness be stimulated? (3) What kind of devices do students use for completing an online survey? In this paper, we answer these questions by documenting a methodology that was developed for the National Service Scheme Survey (N3S) among Ghanaian university students. In a nutshell, our strategy consists of the following elements: offline recruitment of students, the combination of email and text-message invitations and the use of mobile phone credit as a quasi-cash incentive. In order to gain better insights into the prevalent incentive structures among Ghanaian students, we included an experiment in our survey with the specific aim of analyzing the impact of different types and levels of incentives on response rates among our targeted population. Our results indicate that, for this specific subgroup at least, an online strategy can be

very useful if the necessary precautions are taken.

In the remainder of the paper, we will describe our sampling procedures, the incentive scheme and the response to the web survey. We will also provide an analysis of the devices that were used to complete the questionnaire. The first section, however, provides a brief description of the N3S and its main purposes.

2. Setting the scene: the National Service Scheme Survey (N3S) in Ghana

A fundamental challenge facing multi-ethnic societies in general and post-colonial African countries in particular is fostering a sense of national identity which overrides ethnic affiliations. In order to overcome and avoid the manifold problems associated with ethnic heterogeneity (e.g. Reynal-Querrol 2002; Easterly and Levine 1997), most African countries have embarked upon a process of nation-building after gaining independence in the 1960s and have adopted a range of policies in order to foster stronger national identities (Bandyopadhyay and Green 2013). One prominent example of such policies are national youth service programs, which usually entail that university graduates conduct some type of public service.

Ghana has one of the longest running national service programs in Africa –titled Ghana ‘National Service Scheme’ (NSS). Under the existing NSS Act, all Ghanaian students who obtain a Bachelor degree from a university or other tertiary education institution in Ghana or abroad must complete one-year of national service following their graduation. In 2013/2014, more than 70.000 Ghanaian students, conducted their national service (source: Ghana National Service Scheme Secretariat;

<http://www.nssghana.org>).

The objective of the National Service Scheme Survey (N3S) is to analyze to what extent Ghana's NSS program contributes to improving inter-group relations and fostering stronger national identities among its participants. For this purpose, we decided to opt for a quasi-experimental design whereby students were to be interviewed both before and after their participation in the NSS program. The study focuses on two cohorts, namely students enrolled in their final BA year (i.e. 4th year) in 2013-2014 (thus starting national service in September 2014) and students enrolled in their 3rd BA year in 2013-2014 (thus expected to leave for national service in September 2015).

There were a number reasons why we decided to employ a web self-administered questionnaire (WSAQ) (cfr. Callegaro, Lozar Manfreda, and Vehovar 2015). First, the target population was widely dispersed and highly mobile (no fixed address). Second, given the relatively sensitive nature of the topic (i.e. inter-ethnic relations), an interviewer-mediated survey could lead to severe social desirability biases (du Toit 2015). Third, the cost-effectiveness of WSAQ-surveys allowed for a larger sample size within the available budget. However, online surveys –especially in developing countries- have their own methodological challenges, such as sampling, coverage and response issues. Below, we discuss how we tackled these challenges in our survey (for a slightly different approach to similar challenges, see du Toit et al. 2014; du Toit 2015).

3. Sampling and recruitment: A two-stage process

A major challenge from the onset is the absence of a reliable sampling frame, which could have been used to recruit prospective participants of the NSS program. While the NSS Secretariat has the names of all prospective participants, they do not have their contact details. The universities where students are enrolled could also not provide us with a sampling frame of email addresses, as students are usually not given a university email address and neither do students have to register an alternative private email address. Ghanaian universities usually communicate with their students via departmental information boards rather than email.

Hence, in order to recruit our respondents, we designed an alternative sampling and recruitment strategy, consisting of two stages. First, in March/April 2014, we recruited students from a selection of BA programs in three large public universities by means of a short off-line paper-administered self-interview (PASI) (i.e. in-class survey). Second, in August 2014, using the contact information respondents provided during the in-class survey, we invited the students to participate in our web self-administered questionnaire (WSAQ). Figure 1 below visualizes the two-stage sampling and recruitment process. In what follows we expand on its main components.

(Figure 1 somewhere here)

Selection of universities and bachelor programs. Three universities – University of Ghana (UG) in Legon, Kwame Nkrumah University of Science and Technology

(KNUST) in Kumasi, and University for Development Studies (UDS) (with campuses at Tamale, Nyampkala, Wa and Navrongo)- were purposely selected to be included in the N3S. These universities are spread geographically, which ensured that our survey would have an appropriate ethno-regional and religious mix of respondents. The three selected universities are among the biggest public universities in Ghana. The vast majority of Ghanaian students are enrolled in one of the country's nine public universities (86.7% in 2010; Bawakyillenuo et al. 2013).

Next, in order to get a sample of respondents with a broad array of educational backgrounds, we selected a Bachelor program from the most important Faculties across the three Universities: agriculture, administration, chemistry, computer sciences, economics / development studies, engineering, English, nursing, geography and politics. However, not all these Bachelor programs were organised at all three universities. At UDS, for example, programs in engineering, English, geography and politics were not organized and could therefore not be included in the study (for detailed information see Figure 1).

In-class survey. For each of these BA programs, we selected a mandatory course in the 3rd as well as the 4th bachelor year. Before approaching the lecturers of these courses, we sought official permission from the Central University Administration as well as the Heads of Department (HODs) responsible for the selected BA programs. This strategy proved very successful, as the lecturers of only three out of 52 selected Bachelor courses refused participation. When a BA program did not have a course

that was mandatory for all students, multiple courses were selected in order to cover the selected program as much as possible.

Our short in-class survey of 12 to 15 minutes was usually conducted at the beginning of the lecture. The main purpose of this survey was (1) to obtain email addresses and phone numbers from the students and (2) to build trust in the sincerity of our research project among prospective respondents to ensure future participation. In total, 5825 students across the three universities completed the questionnaire. Only a handful of persons refused to participate in the survey. This very low refusal rate does not imply, however, that non-response was completely absent at this stage. Obviously, we were unable to establish contact with students skipping the class in which the survey took place (however, attendance rates are usually high at Ghanaian universities).

Due to a lack of general statistics and figures concerning Ghana's student population, it is unfortunately impossible to assess the extent to which our purposively constructed sample is representative for the overall student population in Ghana. However, one particular finding which may suggest that our sample reflects the overall student population relatively well is Atuahene and Owusu-Ansah's (2013) finding that 37% of Ghanaian students in 2011 were female, while we found that in our sample 36% of respondents were female.

Online survey. In a second stage, we collected the data we were actually interested in by means of a WSAQ. Communication with the students was established in two

ways. First, email was used to invite students to participate in our survey. Second, text messages were sent to respondents' mobile phones informing them that a survey invitation was waiting in their mailbox. Respondents were also informed at this stage about the kind of incentive they could expect in return for participating (i.e. mobile top-up credit; cfr. infra). Using text messaging was of crucial importance to reach our target population. While many Ghanaian students do not check their email on a regular basis, they tend to be as 'attached' to their mobile phones as students in Western countries, or possibly even more given the fewer communication alternatives.

This double communication strategy proved very useful. 255 respondents (i.e. 4.4%) did not provide us with an email address and 1098 of the 5570 email invitations (i.e. 19.7%) bounced back due to incorrect email addresses. By means of text messages, however, we were still able to contact 896 of these respondents with a missing or incorrect email address and to retrieve 528 correct email addresses.

4. Response enhancement: The Tailored Design Method and quasi-cash incentives

The success of our approach, however, crucially depended on the students' willingness to participate in the online survey. Previous research among South-African graduates indicated that response rates can be as low as 10 to 15 per cent when only the web is used as mode of administration (du Toit et al. 2014: 858). In order to maximize the response rate as much as possible, we implemented several principles as set out in the *Tailored Design Method* (TDM; Dillman, Smyth, and Christian 2009). First, the 'costs' (i.e. mainly time investment) to participate in the

survey were minimized by keeping the survey as short as possible given our need for certain measurements. A clear and minimal layout was used to facilitate comprehension of the question and page loading time (which is an important issue given the limited bandwidth). Also in line with the TDM, we implemented a system of reminders via different means of communication. On August 8 2014, respondents were invited to participate in our online survey by email as well as text message. Reminders were sent after 7 and 14 days, again both by email and text message. The online survey was closed on 31 August.

Finally respondents were offered an incentive to complete the online survey. Because cash incentives were practically not feasible, we decided to give respondents an incentive in the form of mobile phone credit or so-called 'top-up'. In the Ghanaian context, a mobile top-up functions as an easily transmittable, quasi-cash incentive, since nearly all students use mobile phones that are credited via a pay-as-you-go system. Individual top-ups were sent using the electronic payment platform from E-tranzact, which allowed us to distribute mobile phone top-ups to all phone providers in Ghana.ⁱ

There is extensive research on the effects of conditional and unconditional incentives in European and American contexts (for a meta-analysis, see Hopkins and Gullickson 1992), which shows that unconditional monetary incentives yield higher response rates. Because very little is known about the impact of incentives in the context of developing countries, however, we included an incentives quasi-experiment in our survey. The quasi-experimental design contained six different

incentive conditions (see Table 1 below). First, variation in the amount of monetary incentive was introduced – i.e. respondents received a mobile top-up of 5 Ghanaian Cedi in conditions 1 and 4 (50% of the sample), 10 Cedi in conditions 2 and 5, and 20 Cedi in conditions 3 and 6 (each 25% of the sample). These amounts correspond to approximately €1.2, €2.4 and €4.8. Given that university students are a privileged section of Ghanaian society, the incentives we offered were relatively small. The three amount-conditions were crossed with a second factor, namely the conditionality of the incentive (conditional upon participation or unconditionally). For the unconditional category (conditions 1, 2 and 3), the mobile phone top-up – together with a text message indicating that the top-up was meant as a token of gratitude for their participation in the survey- was sent just before respondents received the survey invitation. Respondents in the conditional category (conditions 4, 5 and 6) received a text message saying that they would receive their top-up once they had completed the survey. Because classmates are likely to communicate, and because differences in amounts might be perceived as unfair, groups of students enrolled in the same bachelor program rather than individual students were randomized over the conditions. In order to obtain a balanced distribution with respect to relevant covariates, the 64 student groups were allocated to the six conditions using covariate-adaptive randomization (Hu et al. 2014). Specifically, the size of the group, the bachelor year, the university and the discipline were taken into account in this randomization.

(Table 1 somewhere here)

The total number of completed questionnaires upon closure of the survey was 2975. This implies that 51.1% of the 5825 respondents of the in-class survey fully completed the online questionnaire. This figure, however, should not be interpreted as an actual response rate. Since our sample is not probability-based, it is preferable to calculate a so-called participation rate, i.e. the ratio between the number of respondents who have provided a usable response and the total number of initial personal invitations sent out (American Association for Public Opinion Research 2011: 38). This participation rate in the N3S online survey was 54.9% (2947 surveys completed by eligible respondents / 5368 students successfully contacted by mail and/or text message). If partial responses are counted as well, the participation rate becomes 60.8% (3264 at least partially completed the surveys). These figures are remarkably high, and can compete with response rates that are obtained in many face-to-face surveys in Western contexts (cfr. Stoop et al. 2010). The completion rate (i.e. the ratio between the number of completed surveys and the total number of started surveys) was 90.3% (2947/3264).

A comparison of participation rates across the six incentive conditions sheds further light on the impact of the quasi-cash incentives. Table 2 shows an interesting pattern of substantially relevant differences between the conditions. These differences between the six conditions are also statistically significant, but the significance tests should be interpreted with great care, since they are based on the assumption of random sampling. First, higher top-up amounts tend to lead to higher participation ratesⁱⁱ. In the 20 Cedi-condition, participation was on average almost 11 percentage points higher than in the 5 Cedi-condition. There seems to be a ceiling effect,

however: differences between 10 and 20 Cedi top-ups were much more moderate (in the unconditional case, the 10 Cedi condition even delivered a higher response rate than the 20 Cedi condition, but this difference was not significant). This finding corresponds to earlier research which argued that moving beyond a certain amount leads to little or no additional impact on response rates because it is mainly the symbolic value of the incentive that matters (Jobber and Saunders 1988). Second, in line with Western literature, unconditional incentives tend to lead to higher response ratesⁱⁱⁱ. For each of the three different amounts, the participation rate in the unconditional groups was at least 5 percentage points higher. In line with social exchange theory, incentives seem to work more as a means to establish a trusting relationship (which is subsequently reciprocated by the respondent) than as a purely monetary exchange (see Dillman et al. 2009).

(Table 2 somewhere here)

The in-class survey contained a few questions concerning respondents' social and educational background. This information allowed us to answer the question whether different social categories were equally prepared to participate in the online survey. Table 3 provides participation rates by gender, university and bachelor year. For each of these three characteristics, significant differences in participation are detected. First, the participation rate of males turns out to be almost 10 percentage points higher than that of females. This is a remarkable finding given that women are generally considered to participate more in online surveys than men (Boulianne 2013). Second, participation rates vary significantly across universities.

The lowest participation rate was found among students at KNUST located in Ashanti region. Participation at UDS campuses in the northern regions, which are generally the poorest regions in the country with limited access to Internet, was slightly higher. At the UG, which is located in the economically relatively well-developed capital, Accra, the participation rate was almost 7 percentage points higher compared to KNUST. Third, survey participation was significantly higher among 4th year BA students (almost 60% against 50% among 3rd year BA students). The two cohorts differ from each other regarding several background characteristics. In our sample of 4th year students, males and UDS-students were overrepresented. However, this overrepresentation cannot account for the observed gap in participation rate between 3rd and 4th year students. Instead, the higher participation rate of 4th year students is more likely to be the result of the fact that these students were due to leave for national service in the month following the N3S, and were therefore more interested in the topic of our study. This finding illustrates the importance of topic salience for survey participation (see also Dillman et al. 2009).

(Table 3 somewhere here)

A data quality concern that arises in web surveys is that respondents may skip a lot of questions. We therefore calculated the item nonresponse of the entire dataset (i.e. as the proportion of missing responses over all questions that were displayed). On average, the item nonresponse for all questions was 3.5%, which is only slightly higher than in Western web surveys (see Millar and Dillman, 2012; Lesser, Newton, and Lang, 2012).

5. Devices and software respondents used to complete the survey

An assessment of the feasibility of online surveys among Ghanaian students should also pay attention to the technological devices to which students are likely to have access to (Callegaro 2010). Ghanaian university campuses host numerous small, privately run Internet cafés and some universities have campus-wide Wi-Fi networks. Further, some students own a smart phone, tablet or laptop with which they can connect to the Internet. In order to optimize future survey designs, it is useful to know which devices respondents have used to complete our online survey, and with which software these devices were equipped. Our data collection provides unique and extremely useful data on these issues. However, it is important to note that we only have this information for students who actually participated in the online survey. For the roughly 45% of respondents who did not complete the survey, we do not know to what extent their non-participation was the result of a lack of access to an appropriate IT device or internet. This is an important avenue for future research.

For all respondents who logged on to the survey platform, the so-called user agent was saved. The user agent string contains information concerning among others the device type, the operating system and the browser. We used Stata plugin *PARSEUAS* (Roßmann and Gummer 2014) to extract this information. Table 4 summarizes which devices were used by respondents to complete the N3S online survey. Surprisingly, more than half of the respondents used a mobile device to fill out our questionnaire (24.5% mobile phones and 29.9% tablets). Most of these mobile devices used Android as an operating system. The remaining 46.7% used 'other' devices (mainly

laptops or desktops). Within this category, Windows is by far the most popular operating system.

(Table 4 somewhere here)

There are clear differences in device usage patterns across the three universities. At UDS in the North, mobile phone usage is 10 percentage points lower than at UG (Legon) and KNUST (Kumasi). Conversely, PCs and to a lesser extent tablets are used more frequently at UDS. The explanation for these regional differences may be that students in the relatively poorer northern regions are less able to afford a smart phone. In addition wireless Internet infrastructure is also less developed in the northern regions, making a mobile phone a less attractive device to fill out a questionnaire.

Besides features of the device, the browser can also have repercussions for respondent-survey interactions. Contrary to global browser usage trends, not Google Chrome but Mozilla Firefox is by far the most popular browser for non-mobile devices (see Table 5). Most Ghanaian students hardly use Internet Explorer and Safari on laptops and PCs. For mobile devices, the picture is quite different. The vast majority of tablet users browse the web using Opera, while Safari is the most popular browser on mobile phones. This latter finding should be treated with caution, however, since it is known that some Android-based browsers identify themselves wrongly as Safari.

Thus, a large share of respondents used mobile devices with relatively small screens and specific browsers to fill out our questionnaire. Therefore, it does not suffice, for this specific population at least, to optimize an online survey experience primarily for laptop/PC use and associated browsers such as Chrome or Internet Explorer. Hence, researchers targeting this particular population are well advised to optimize their survey design for both laptop/PCs as well as other mobile devices.

(Table 5 somewhere here)

6. Conclusion

This paper set out to contribute to the methodological and practical knowledge concerning the conduct of surveys in developing countries, by documenting the methodology of the National Service Scheme Survey (N3S) conducted in Ghana.

The methodology of the N3S showed that offline survey recruitment followed by an online survey proved to be a very suitable strategy for obtaining a large sample of university students. Given the short and accessible nature of the in-class survey, the vast majority of students showed willingness to complete the off-line paper-administered self-interview (PASI). The subsequent invitations for the online survey were sent both by text message and email. This double communication strategy allowed for direct and personal contact with the respondents during the online recruitment process. With a participation rate of almost 55%, this recruitment strategy proved highly successful.

The incentives experiment implemented in the N3S showed that quasi-cash incentives in the form of mobile phone credit can be successfully used to motivate students for participating in web surveys in developing countries. Generally, higher participation rates were found in conditions with a higher incentive amount, although a ceiling effect was observed. Furthermore, unconditional incentives tended to yield higher participation rates. These findings are in line with survey methodological research conducted in Western countries, and suggest that the available methodological knowledge is also relevant in the context of developing countries.

Finally, we found that mobile devices were very popular for completing our online surveys. A majority of students used either a smart phone or a tablet. However, access to these mobile devices seems to differ substantially across regions in Ghana. This unequal access may be the result of relatively poorer economic conditions as well as a less developed wireless Internet structure in the northern regions. Hence future survey designs should keep this finding in mind and aim to optimize surveys for both PC/laptops and mobile devices.

While this paper provides important methodological insights and practical knowledge about conducting an online survey among a student population in Ghana, more research is clearly needed on a range of things, including to what extent internet availability and access to IT devices influenced response rates across individuals, groups and regions, to what extent different incentive structures and modalities may lead to different responses rates, and to what extent the insights

gained in this project are applicable to non-student populations in Ghana as well as in other African countries.

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Figures & Tables

Figure 1: Two-stage recruitment process of the N3S

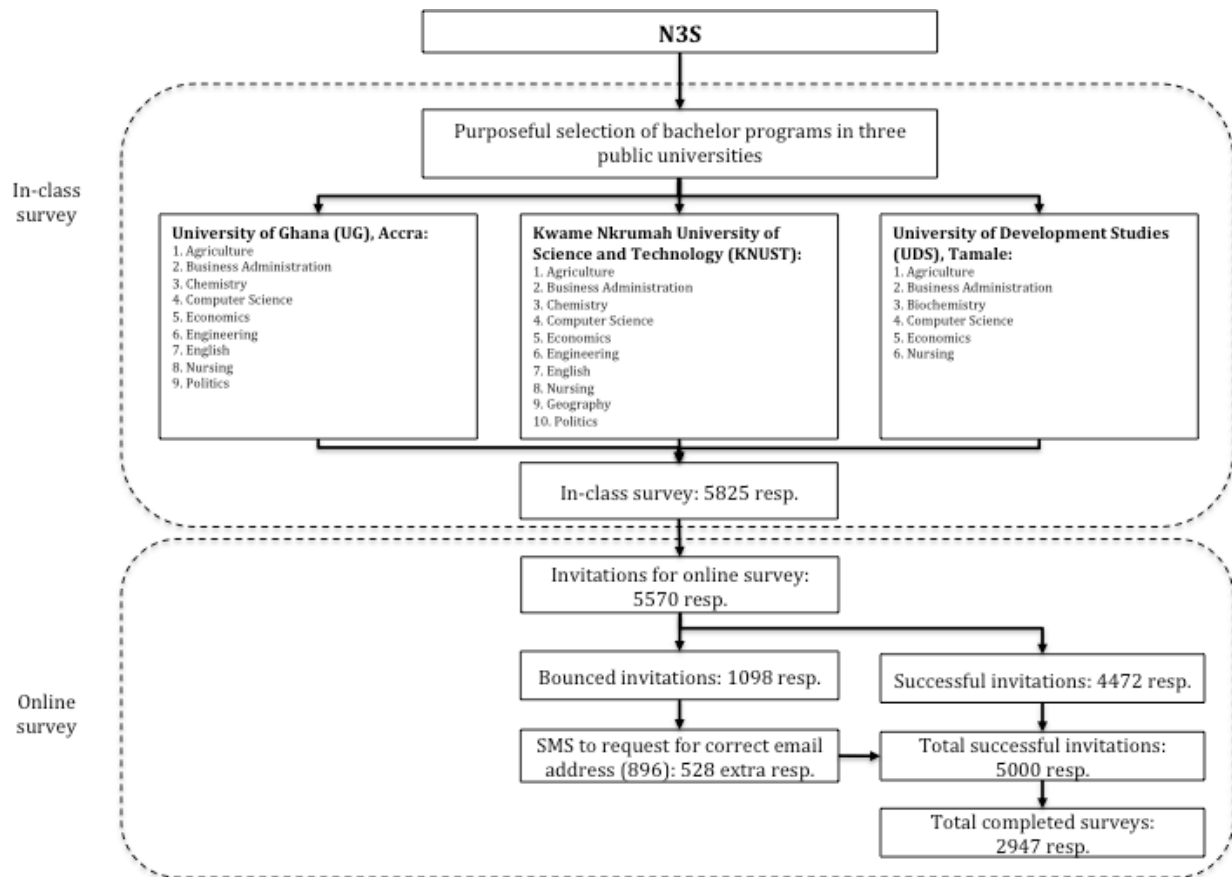


Table 1: Six incentive conditions

	Unconditional payment	Conditional payment
5 Cedi	1	4
10 Cedi	2	5
20 Cedi	3	6

Table 2: Participation rates in the N3S online survey by condition

Condition	No complete response	Complete response
1	47.1% (562)	52.9% (631)
2	35.0% (221)	65.0% (410)
3	36.6% (273)	63.4% (472)
4	52.0% (796)	48.0% (736)
5	47.8%(320)	52.2% (350)
6	51.7% (249)	58.3% (348)
Chi ² = 83.123; Df = 5; p < 0.001		

Table 3: Participation rates by gender, university and bachelor year

	No complete response		Complete response		Chi ² -test
Total	2421	45.1%	2947	54.9%	
Gender					Chi ² =
Male	1444	41.8%	2011	58.2%	42.532; df =
Female	975	51.0%	935	49.0%	1; p < 0.001
University					Chi ² =
UDS, Tamale	575	46.4%	664	53.6%	20.280; df =
UG, Legon	907	41.5%	1278	58.5%	2; p < 0.001
KNUST, Kumasi	939	48.3%	1005	51.7%	
Bachelor year					Chi ² =
3rd BA	1312	50.4%	1293	49.6%	56.594; df =
4th BA	1104	40.1%	1647	59.9%	1; p < 0.001

Table 4. Devices and operating systems used in the N3S – by university

Device	OS	UDS, Tamale	UG, Legon	KNUST, Kumasi	Total
Mobile phone	Total	16.3%	27.7%	25.4%	24.5%
	Android	12.1%	20.1%	18.2%	17.7%
	iOS (iPhone)	1.6%	4.7%	4.0%	3.8%
	Windows	2.4%	2.4%	2.6%	2.5%
	others	0.2%	0.5%	0.6%	0.5%
Tablets	Total	31.4%	27.5%	29.0%	28.9%
	Android	30.4%	25.1%	27.2%	27.0%
	iOS (iPad)	0.5%	1.5%	1.2%	1.2%
	others	0.5%	0.9%	0.6%	0.7%
Other (PC, laptop,...)	Total	52.3%	44.7%	45.5%	46.8%
	Windows	42.2%	40.0%	41.7%	41.1%
	Mac OS	0.9%	0.5%	0.2%	0.5%
	Linux	2.0%	1.4%	0.9%	1.4%
	Others	7.2%	2.8%	2.7%	3.8%
N		635	1231	967	2833
Chi ² = 72.089; Df = 20; p = <.0001					

Table 5. Web browser - by device

	Mobile phone	Tablet	Other (PC, laptop,...)	Total
Firefox	4.3%	1.2%	62.2%	30.5%
Internet Explorer	10.1%	0.7%	4.8%	4.9%
Safari	63.8%	6.6%	0.6%	17.8%
Chrome	19.0%	2.4%	21.8%	15.5%
Opera	1.3%	88.6%	7.6%	29.4%
Others	1.4%	0.4%	3.0%	1.9%
N	691	818	1324	2833
Chi ² = 3516.166; Df = 10; p = <.0001				

Endnotes

ⁱ E-tranzact provides an electronic payment platform, which operates in Nigeria, Ghana, Kenya, Zimbabwe, South Africa, Côte d'Ivoire and the United Kingdom. Their services include payments through ATM, Internet, POS and mobile phone. See for more information: www.etranzact.com.

ⁱⁱ Test for significant difference between incentive amounts: Pearson $\text{Chi}^2 = 52.025$; Df = 2; $p < 0.001$.

ⁱⁱⁱ Test for significant difference between conditional and unconditional incentive groups: Pearson $\text{Chi}^2 = 31.760$; Df = 1; $p < 0.001$.