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The Sustainability Consciousness Questionnaire (SCQ): the theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development

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The Sustainability Consciousness Questionnaire (SCQ): the theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development

Abstract

In this article, we introduce the concept of *Sustainability Consciousness* that refers to an individual's experience and awareness of sustainable development. Building on the UNESCO definition of sustainable development, we theoretically and empirically develop a questionnaire instrument (SCQ) based on the construct. Using data of 638 18-19 year-old respondents from Sweden, we develop the scale in two versions. The long version (SCQ-L) can be used to measure individuals' environmental, social and economic knowingness, attitudes and behaviors (nine valid and reliable subscales), as well as the second order constructs of *sustainability knowingness*, *sustainability attitudes* and *sustainability behaviors*, and the third order construct, *sustainability consciousness*. For the short version (SCQ-S) we identified 27 items that can be used to measure the second and third order constructs. Both versions of the scale present excellent psychometric qualities. We discuss possible applications of the questionnaire instruments in the context of evaluation of sustainability policies, practices and **stakeholder engagement**.

Keywords

Empirical validation of the Sustainability Consciousness questionnaire; Questionnaire Instrument; Stakeholder Engagement; Sustainability Consciousness; Sustainability Policy; Sustainable Development; Sustainable Development Policy; Theoretical development of the construct of Sustainability Consciousness

1. Introduction

The aim of this article is to report on the development of a theoretically grounded and empirically validated scale to measure *Sustainability Consciousness*. During the last few decades, the world community has agreed upon the need to address sustainable development through international treaties. As a response, sustainability initiatives have been launched as a means of coping with sustainability in different areas of society such as business, health, and education. However, empirical studies are a missing link when it comes to evaluating citizens' responses to **stakeholder engagement and sustainable development policies**. Instead, decisions and implementation strategies are heavily based on policy recommendations and gut feelings on the part of practitioners. In this paper we define and operationalize the concept of Sustainability Consciousness. First, we describe the theoretical foundation of the concept of sustainability consciousness, and how it builds on frameworks of sustainable development and environmental

consciousness. Thereafter, we outline the structure of the concept and how the questionnaire was built. Based on data collection in Sweden, we then describe how we validated the questionnaire instrument. Finally, we present the results of the empirical development of a short version of the questionnaire for more accessible use. In sustainability studies, we were unable to identify any existing scale that comprehensively covers, and has the capacity to measure, the holistic and integrative concept of sustainable development. By providing this instrument, we hope that an important gap has been filled, and that researchers and practitioners in the field of sustainability studies will now have an instrument that they can use to investigate and evaluate peoples' perceptions of various kinds of efforts regarding the promotion and evaluation of sustainable development through policy, communication or education.

2. Theoretical background

2.1 Sustainable Development

Sustainable Development (SD) has become an important concept for policy-makers worldwide since the concept was propagated internationally by the *World Commission on Environment and Development* (WCED) in 1987 (Smyth, 2008). The WCED's Brundtland report defined SD as '...a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs' (WCED, 1987, p. 41). Some years later, the *World Conservation Union* (IUCN), the *United Nations Environment Program* (UNEP) and the *World Wide Fund For Nature* (WWF) extended the definition of SD into: '...improving the quality of human life while living within the carrying capacity of supporting ecosystems' (IUCN/UNEP/WWF, 1991, p. 10). The United Nations summit in Rio in 1992 established Agenda 21, the action plan for SD, for organizations and governments around the world, to be executed at the local, national and global level. In that action plan, social and economic dimensions were equally recognized, along with environmental perspectives, as a way of understanding and working with SD. From that time, the tradition of structuring SD around three dimensions, namely the environment, the economy and society, was established and widely accepted (e.g. Giddings, Hopwood & O'Brien, 2002; Summers & Childs, 2007). **The development of SD as a policy driven concept has been a criticized discourse (Kopnina, 2014; Sinakou, Boeve-De Pauw & Van Petegem, 2017). Specifically, SD has been suggested to support a neoliberal agenda by combining the seemingly polysemous meanings of conservation (in sustain the environment) with development (as in economic development and growth) (Hursh, Henderson, & Greenwood, 2015; Kumi, Arhin & Yeboah, 2014). Still, the idea of SD has been the benchmark and driver of most efforts all over the world to accomplish social, economic and environmental goals.**

In some definitions, the environmental dimension is referred to as the ecological dimension, and cultural issues are sometimes included in the social dimension. It is sometimes described in their own as a fourth dimension (Keitsch, Kua & Skjerven, 2016). In the current study we use the term 'environment' to include the ecological aspects of SD, and cultural issues

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3 to be included in the social dimension. The environmental dimension emphasizes maintaining
4 biological diversity, sustainable ecological processes and resiliencies (Atkinson, Dietz &
5 Neumayer, 2007). *Environmental SD* is the safeguarding of natural resources in order for material
6 cycles to fit into the global cycles of materials, but also be aligned to local eco-systems (Rauch,
7 2002). *Social SD* emphasizes equity between humans of different populations and within
8 populations, as well as between present and future generations, along with security and good
9 health (Atkinson, Dietz & Neumayer, 2007). *Economic SD* aims for a market-based economic
10 system that can generate growth and welfare for everyone, leading to poverty reduction and
11 employment, while maintaining corporate responsibility (Atkinson, Dietz & Neumayer, 2007).

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15 This way of describing SD by the three hierarchically equal dimensions of the
16 environment, economy and society is often referred to as the ‘three pillars’ of SD (Giddings,
17 Hopwood & O’Brien, 2002). **The concept is often represented by three interconnected and**
18 **overlapping rings, which represent the environmental, economic and social dimensions. The**
19 **three-ring model has been criticized for degrading the environmental dimension in relation to the**
20 **economic and social dimensions (e.g. Kopnina, 2014), and other ways of understanding the**
21 **relationships between the dimensions has been suggested, see Giddings, Hopwood and O’Brian**
22 **(2002) and Walshe (2013). However,** during the twenty years following the Rio meeting, the
23 three-ring model has been widely endorsed by international organizations such as UN, and has
24 been adopted by national governments and organizations (Lehtonen, 2009). This was shown in
25 the Rio+20 Meeting (United Nations Conference on Sustainable Development), where a new
26 integrated agenda beyond 2015 was proposed that would ensure the promotion of an
27 economically-, socially- and environmentally-viable future for the planet, and was explicated in
28 the Sustainable Development Goals (UN, 2015). Accordingly, the SD agenda should fully
29 integrate “...the economic, social and environmental dimensions of sustainable development in a
30 coherent, holistic, comprehensive and balanced manner” (UNEP, 2015, p. 3), which was also
31 reiterated by the UN Secretary-General’s report “The Road to Dignity by 2030” (UN, 2014).
32 Hence, this way of understanding and working with SD in terms of the three dimensions has
33 become a global benchmark and a common ground for most SD initiatives worldwide.
34 Sustainability initiatives can, therefore, be seen to play an important role in different areas of
35 society such as business, health, education and in various kinds of sustainability literacy efforts in
36 the coming decades. There are, however, very few psychometrically-sound instruments available
37 to measure this kind of literacy, and none that cover the holistic framework of SD. This paper
38 describes the validation and development of the Sustainability Consciousness Questionnaire
39 (SCQ), which aims to meet this need.

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48 Our point of departure is the theoretical standpoint which SD efforts are based upon: the
49 three pillars of SD. It is important to note that these dimensions have been further divided into
50 more explicit themes. This started in the Agenda 21 document, and was in the latest United
51 Nations Millennium Development Goals, defined in terms of eight goals that are now
52 transitioning into 17 Sustainable Development Goals, to be achieved by 2030. Most of the goals
53 are related to the societal level, and are therefore not easy to address from an individual
54 perspective through a questionnaire instrument. However, the UNESCO Framework for the UN
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Decade of Education for Sustainable Development (UNESCO, 2006), proposes a number of sub-themes to the three SD dimensions, which can inform understanding (and learning) from an individual perspective. The *social sub-themes* are: 1) human rights; 2) peace and human security; 3) gender equality; 4) cultural diversity and intercultural understanding; 5) health; 6) HIV/AIDS and 7) governance. The environmental sub-themes are: 8) natural resources (water, energy, agriculture and biodiversity); 9) climate change; 10) rural development; 11) sustainable urbanization; 12) disaster prevention and mitigation. The economic sub-themes are: 13) poverty reduction; 14) corporate responsibility and accountability and 15) market economy (UNESCO, 2006, 18-21). Moreover, according to the UNESCO framework (UNESCO, 2006) these dimensions should be expressed in peoples' knowledge, attitudes and behaviors.

In the current study we present our findings on the development and validation of the SCQ. This taps into individuals' consciousness regarding SD as holistic concept, in terms of the 15 subthemes.

2.2 *Consciousness*

The concept of *consciousness* can have many different meanings in psychological research. According to Velmans (2009a), three main referents can be found. First, consciousness is often used synonymously with self-consciousness, as one differentiates oneself from the surrounding world. Second, consciousness is used to refer to a state of wakefulness. Third, consciousness is sometimes used to mean knowledge, in the sense that if one is conscious of something, one also has knowledge of it. However, knowledge can be non-conscious and consciousness does not necessarily involve knowledge. Therefore, the definition of consciousness can be referred to as experience itself, and consciousness can be exemplified by all things we can observe or experience (Velmans, 2009b). This last conceptualization is the one we have used in the current study to refer to the presence, or awareness, of experienced phenomena. *Sustainability Consciousness* (SC), then, refers to the experience or awareness of sustainability phenomena. These include experiences and perceptions that we commonly associate with ourselves such as beliefs, feelings and actions. Furthermore, Velmans (1999) concludes that a perception becomes consciousness when "...information is sufficiently well integrated to be disseminated throughout the brain" (p. 561). Hence, by using a questionnaire instrument and including explicit questions regarding sustainability issues, we will get information regarding the respondents' sustainability consciousness. Our concept of SC is totally operational in that it does not presuppose the physiological nature of consciousness, and in what way it should be linked to the brain, as contested between more phenomenological respectively reductionist theories of consciousness. Instead, the aim of this study is to develop an operational concept of SC that could be used to measure the impact of interventions **of different stakeholders**, in order to compare different groups in longitudinal or cross-sectional studies.

2.3 *From Environmental Consciousness towards Sustainability Consciousness*

To the best of our knowledge, this is the first time someone has undertaken the challenge of defining SC as a construct, and operationalizing it into a psychometrically valid instrument. As

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3 far as we are aware, there is no comprehensive psychometric instrument covering the total scope
4 of sustainability in relation to its broad and inclusive interpretation. However, *Environmental*
5 *Consciousness* has been used as a term for various constructs and measurements (Kollmuss &
6 Agyeman 2002; Schlegelmilch, Bohlen & Diamantopoulos, 1996; Sharma & Bansal, 2013). The
7 term has been used in different domains of research such as business studies, psychology,
8 sociology and environmental studies. The use of the concept of environmental consciousness
9 differs between disciplines, and even between studies within a discipline. However, there are
10 some common features in the interpretation of environmental consciousness in most studies, as
11 will be outlined below.
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15 Sarrica et al. (2016) concluded that environmental consciousness could be conceived as a
16 multidimensional function including ‘intermingled psychological components’, which they
17 divided into cognitive, affective and evaluative sub-components. Marketing and business
18 research are the disciplines in which environmental consciousness has been most frequently
19 explored and used. Here, it has been used as a descriptor and measurement of pro-environmental
20 actions at many different levels (individual, organization, country). For example, Sarkis (1995)
21 investigated companies’ environmental practices and graded them as being environmentally
22 conscious or not; Ahmed, Montagno and Firenze (1998) found that more environmental
23 conscious companies have better earnings. Similarly, Rivera-Becerra and Lin (1999) identified
24 criteria that define and measure environmentally conscious companies. Petrakis and Xepapadeas
25 (1996) investigated and classified environmentally conscious countries. In such studies, the
26 performance of organizations as a whole is studied, but in some cases survey instruments are also
27 used, and the results extrapolated as reflecting the organization as a whole. This can be seen in
28 the work of Schweizer-Ries (2008) in which environmental consciousness is a key in the
29 transactional interrelationship between humans and new energy-saving technologies.
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35 In a more psychological research tradition, environmental consciousness has been
36 explored as a construct measuring the awareness of environmental issues and, in most studies, it
37 has been explored in the relation to action, often in a pro-environmental direction (Schlegelmilch,
38 Bohlen & Diamantopoulos, 1996; Jiménez Sanchez & Lafuente, 2010, Sharma & Bansal, 2013).
39 According to Zelezny and Schultz (2000), environmental consciousness consists of a belief
40 system that refers to specific psychological factors related to individuals’ propensity to engage in
41 pro-environmental behavior. Sharma and Bansal (2013) defined environmental consciousness as
42 a mental state related to environmentally-friendly behavior. Sharma and Bansal (2013) propose a
43 model that links environmental consciousness with ecological purchasing behavior, which
44 consists of various knowledge and attitudinal components. Similar components of environmental
45 consciousness go back to Schlegelmilch, Bohlen and Diamantopoulos (1996) who measured
46 environmental knowledge, attitudes and behavior/action in their construct of environmental
47 consciousness that was developed to study consumer behavior. Krause (1993) developed a
48 questionnaire investigating environmental consciousness, based on an understanding or
49 awareness of environmental issues and attitudes, and the willingness to make life-style changes
50 (behavior). Also, Kriwy and Mecking (2012) investigated the importance of environmental
51 consciousness for purchasing and eating organic food. In their study, they used an instrument
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3 developed by Diekmann and Preisendörfer (2003) that was based on the affective, cognitive and
4 conative dimensions of environmental concern.

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6 In addition to studies of environmental consciousness, there are many widely-used scales
7 within the realm of environmental studies such as the New Ecological Paradigm Scale (NEP;
8 Dunlap, Van Liere, Mertig & Jones, 2000), the Two Major Environmental Values (2-MEV;
9 Bogner & Wiseman, 1999, 2006), the Children's Environmental Attitude and Knowledge scale
10 (CHEAKS; Leeming, Dwyer & Bracken, 1995) the, Environmental Attitudes Inventory (Milfont
11 & Duckitt, 2010) and Environmental Concern (Fransson & Gärling, 1999; Lezak & Thibodeau,
12 2016) etc. However, all of these instruments lean towards environmental attitudes and, as such,
13 have a narrower scope than is the case with the concept of environmental consciousness.
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16 In the realm of environmental studies, Jiménez Sanchez and Lafuente (2010) have
17 perhaps conducted the most ambitious empirical, as well as, theoretical work in terms of defining
18 and operationalizing the full breadth of environmental consciousness. They define environmental
19 consciousness from a multidimensional and behavior-oriented point of view in which
20 environmental consciousness is related to pro-environmental behavior, and mostly shaped by the
21 attitudinal dimension. The construct as a whole consists of four dimensions: the affective
22 dimension (general beliefs and values), the dispositional dimension (personal attitudes), the
23 cognitive dimension (information and knowledge), and the active dimension (pro-environmental
24 behavior).
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27 From this review of previous work regarding the conceptualizations and
28 operationalization of environmental consciousness, we can conclude that there are some common
29 aspects. First, environmental consciousness needs to be an inclusive concept mirroring the
30 different components of human consciousness. This is also in line with the Velman definition of
31 consciousness (2009a,b). The different operationalizations of environmental consciousness all
32 include constructs of knowledge, attitudes and behavior. These constructs are often further
33 divided into various sub-categories such as concerns, awareness, intentions, willingness and so
34 on, but the three building blocks are always present. Moreover, environmental consciousness has
35 been found to be continuous, rather than dichotomous (Sharma & Bansal, 2013). In all the
36 instruments there is a positive direction with regard to the answers to the items, i.e., more
37 knowledge, positive attitudes and willingness to act in a pro-environmental way. The
38 psychological constructs, as represented by the overall categories of knowledge, attitudes and
39 behavior, have then been related to a specific topic. This topic is, of course, always related to the
40 environment in the sense of the surrounding nature or aspects of attitudes and actions in favor of
41 the natural environment (e.g. ecological consumption). However, a great variation in the topics
42 can be seen between the different instruments, and most of them focus quite narrowly, making
43 them very topic- and context-dependent. This implies that most instruments are suitable only for
44 specific contexts (e.g. organic food consumption, energy saving, etc.) and only few take a broader
45 perspective (Jiménez Sanchez & Lafuente, 2010). These do however still operate only within the
46 environmental dimension of sustainability issues.
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49 Environmental problems and concerns are, nowadays, understood as complex or 'wicked'
50 (problems where the answer is not given in beforehand and that are difficult to solve due to
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3 conflicting interests) issues involving societal and economic dimensions. Hence, environmental
4 problems cannot be solved by paying attention to the environmental issues alone. Instead,
5 environmental problems need solutions based in society and the economy as well (UN, 2015; **Le**
6 **Blanc, 2015**). People do not need to develop only environmental consciousness, but also a broad
7 sustainability consciousness, including societal and economic perspectives.
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10 When looking into the field of sustainability research there are very few psychometric
11 instruments available. Biasutti and Surian (2012, p. 77) investigated a scale relating to
12 educational competences ‘...about learning to be, learning to live together sustainably, learning
13 to know, learning to do [and] learning to transform oneself and society’. We found this scale too
14 narrow for the purpose of developing our SCQ. Recently, Biasutti and Frate (2017) have further
15 developed their instrument, and created a new scale of attitudes towards SD based on the three-
16 pillar model of SD, including items related to the environment, the economy and society. In
17 addition, they also added items related to education for the purposes of SD. Since that scale
18 focuses solely on attitudes and, as such, does not include knowledge and behaviors, we found this
19 instrument too restricted to serve as a basis for developing an instrument for SC.
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23 Michalos et al. (2012) developed a scale for measuring knowledge, attitudes and behavior
24 with regard to SD, and in their work they used the UNESCO framework as a theoretical
25 foundation for formulating the items. We considered this instrument as a suitable starting point
26 for our aims, since it is built from a holistic perspective. It appeared suitable for two main
27 reasons: 1) the instrument includes the three psychometric constructs of knowledge, attitudes and
28 behavior as implied by the consciousness literature; 2) the instrument covers the three dimensions
29 of SD as identified in the literature describing SD. Therefore, in order to develop the SCQ, we
30 used this instrument as a starting point for further development, as described below in the
31 methods section.
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35 **2.4 The sustainability consciousness questionnaire**

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37 Based on the theoretical foundations noted in previous sections, we set about constructing the
38 holistic concept of SC and operationalizing it in the form of a questionnaire instrument. The
39 Sustainability Consciousness Questionnaire (SCQ) aims to encompass the three dimensions of
40 SD in a way that covers the 15 UNESCO (2006) sub-themes. Moreover, based on the holistic
41 inclusiveness of environmental consciousness, we included the constructs of knowledge, attitudes
42 and behavior in the SCQ. The change in people’s knowledge, attitudes and behavior are also
43 pointed out in the UNESCO framework (2006; **2009; 2014**) as being essential for accomplishing
44 SD.
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48 The term *knowledge* is associated with factual knowledge, and thereby often perceived as
49 an objective truth. This is not in line with the concept of SD, in which the solution of
50 sustainability issues is seen as complex and context-dependent, and therefore negotiable (Stables
51 & Scott, 2002; Sund, 2013). There is seldom one way of solving SD-related problems and most
52 often compromises have to be negotiated. Moreover, what is factually correct in one context
53 might not be so in another context. In response to these assumptions, in the SD framework, we
54 aligned SC with the ideas of Von Glasersfeld (1990) who argued for a theory of knowing instead
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of a theory of knowledge, in which *knowingness* has both a cognitive, knowledge-based component and an affective-based component. In SC, knowingness involves those issues that could be regarded as offering recognition of the fundamentals of SD and, thereby, incorporates affective as well as cognitive aspects. **Knowingness withholds many similarities with the construct of belief because it investigates the state of mind in which a person thinks something to be the case, which is in line with Pajare's (1992, p. 316) definition of belief as an individual's judgment of the truth.**

Evaluative responses, as used in Likert scale questionnaires, can be divided into three categories: cognitive, affective and behavioral (Fishbein & Ajzen, 2010), and we argue that by basing the SCQ on the knowingness, attitudes and behavior items related to SD, we build these aspects into the construct of SC. The cognitive responses can be described as thoughts, opinions or ideas about an object, and are mostly found in the knowingness items, but also, to some extent, in the attitude items. The affective responses are composed of emotions, moods or feelings, and are mostly reflected in the attitude items, since attitudes can be defined as an enduring positive or negative feeling about some object, person or issue (Chaiken & Baldwin, 2008; Kollmuss & Agyeman, 2002). However, as discussed previously, they can also be related to knowingness. Finally, the behavior items evaluate the tendency of a respondent to engage in behavior in favor of, or opposed to, the attitude object (Eagly & Chaiken, 1993). Hence, by including the three psychological constructs of *knowingness*, *attitudes* and *behavior* (KAB) in the SCQ, a holistic approach is taken to the investigation of peoples' cognitive and affective views of SD. The K section embraces what people acknowledge as the necessary features of SD. Section A reflects the attitudes towards the SD issues, and Section B indicates what people do in relation to the SD issues under consideration.

In the SCQ instrument, these three psychological constructs are then related to the three dimensions of SD (environment, society, economy). This results in nine sub-factors within the questionnaire (K_{ENV} , K_{SOC} , K_{ECO} , A_{ENV} , A_{SOC} , A_{ECO} , B_{ENV} , B_{SOC} , B_{ECO}), as illustrated in Figure 1. Moreover, the items in the SCQ cover the full spectra of the 15 sub-themes of SD as defined by UNESCO (2006; 2009; 2014). However, in the development of the framework it was decided to exclude one sub-theme, rural development, which was considered to be exclusively situated in a developing country context in the UNESCO definition. Therefore, it would be problematic to relate to this issue for respondents in industrialized and urbanized countries such as Sweden. The questionnaire however includes several items relating to development that is valid from a rural as well as an urban perspective.

As shown in Figure 1, the SCQ is a multi-faceted instrument. It is possible to measure the integrated and holistic concept of SC in itself, but at the same time one can measure knowingness related to SC (sustainability knowingness), attitudes related to SC (sustainability attitudes) and behavior related to SC (sustainability behavior). In addition, it is also possible to specifically measure knowingness, attitudes and behavior within each dimension. In this way, the SCQ provides measurements of peoples' views of SD at three levels (see Figure 2).

[Please insert Figure 1 here]

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In our research group we have developed and worked with the SCQ since 2012. This work has primarily been conducted with the aim of evaluating the implementation effects of education for SD in the Swedish school system. In those efforts, we have developed three different, yet comparable, versions of the instrument adopted for different ages (12-13, 15-16 and 18-19). These studies have primarily had an empirical focus and have resulted in the following publications: Authors, 2014; Authors, 2015a; Authors, 2015c; Authors, 2016a; Authors 2016b; Authors 2017. In the current paper, we aim to summarize the entire development process and, for the first time, give a complete and comprehensive description of the SCQ validation process. In doing so, we will focus on the version of the instrument used for the 18-19 year-old age group. Based on our experience of using the SCQ, we would claim that it can be used for all ages from 15-year-olds upwards, though this must be tested empirically. Moreover, due to the generality of the topics (based on the UNESCO framework), it can be used in most contexts in which sustainability efforts are to be evaluated, or whenever there is a need to investigate or evaluate the settled way of thinking regarding SD among a population.

A second aim of the current paper is to develop and present a shorter version of the SCQ which we will denote SCQ-S (short), compared to the original long version, SCQ-L (long). In that way, we hope that the instrument will be even more accessible and useful, since it is a valid instrument which will not take long to distribute, complete and analyze. Our ambition is that, through the current paper, we can provide a long-needed instrument for scholars and practitioners working with sustainability issues.

[Please insert Figure 2 here]

3. Methods

3.1 Developing the item battery

We used the Michalos et al. (2012) survey instrument as a starting point for the development of a questionnaire with the ability to measure the aspects we specifically aimed for. Each item in the Canadian questionnaire was developed by our group to relate to the 15 UNESCO (2016) sub-themes relating to SD. **The basis of the items in the UNESCO framework was important, since this definition of SD is based on the theoretical foundation of three-ring model of SD that is recognized and widely used in policy documents, educational curricula, organizational guidelines, etc. world wide (e.g. UN 2014, 2015; UNEP, 2015).**

To develop a questionnaire with the capacity to capture SC, we categorized each item of the questionnaire developed by Michalos et al. (2012) into one of the environmental, economic or social dimensions of SD, according to our theoretical framework. Two researchers within our team independently coded the items into the separate SD dimensions according to the definition of SD dimensions specified as sub-themes in the UN DESD framework (UNESCO, 2006). To strengthen the inter-rater-reliability of the coding process, and the face validity of the

questionnaire, a group of four additional researchers (with broad expertise in various fields of research such as biology, education and sustainability studies) discussed the coding of the items based on the definitions and sub-themes in the UNESCO (2006) document. Where there were differences in opinion, a joint decision on the coding of the item was achieved after discussion. Eleven items in the original Michalos (2012) survey were not possible to code into any of the SD dimensions. An example of such an item is ‘Sustainable development requires people to learn things throughout their lives’, which was removed after consensus between all six researchers involved. We also removed two knowledge items from the questionnaire, which were focused on specific facts and, therefore, did not fit the knowingness part of the questionnaire. The items of this knowingness section are concerned with what the students acknowledge to be necessary components of SD. Items in the attitude section were generally stated as: ‘I think that...’ or ‘I think it is important that...’, thus indicating a positive or negative evaluation of the issue under consideration. The behavior section examines the extent to which students perform SD-related actions. Furthermore, to ensure that the items of the SCQ-L questionnaire cover the sub-themes of the UNESCO framework, and that there were enough items for sound statistical inference, we added two completely new items coded to the social dimension, and two to the economic dimension. The four additional items are shown in Table 2 (K20, K21, B9 and B16). We ended up with a battery of 50 items spread across the knowingness, attitudes and behavior aspects of the environmental, social and economic dimensions (see Table 1). All items of the questionnaire were translated from English to Swedish by a professional translator at the English Department of the university, and then back-translated to English by another language expert to ensure a correct translation into Swedish.

Due to too much policy language in the original items, we made major language improvements for a better understanding. Of our 50 items in the SCQ-L, only two kept exactly the same formulation as in the original Canadian questionnaire. For example, ‘SD requires shifting to the use of renewable resources as much as possible’ became ‘Sustainable development requires a shift to renewable natural resources’. Another example is ‘The present generation should make sure that the next generation can live in communities that are at least as healthy as those that exist today’, which became ‘I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today’.

[Please insert Table 1 here]

3.2 Pilot study and data collection protocol

To further optimize the content validity and language of the items, a pilot-study was conducted in which 45 Swedish grade twelve students aged 18-19 participated. The students were asked to mark items that they had difficulties with when completing the survey. Two focus group discussions with 5 and 8 respondents respectively were then conducted to identify problematic items and to discuss interpretations and suggestions by the students on how to improve the

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3 identified items. After the pilot study, further language edits were made in Swedish to improve
4 the respondents' understanding of the questionnaire items, followed by a final translation back
5 into English.
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7 From the beginning of March to the end of May 2013, data were collected in 15 schools
8 in different regions of Sweden as part of a larger evaluation study of the effects of the
9 implementation of education in terms of SD. Eight of these schools were selected based on an
10 explicit approach to education for SD. The additional seven schools were selected to match these
11 schools in all aspects (e.g. number of pupils, geographic location and socio-economic factors
12 found in a database provided by the Swedish National Agency for Education (2013) with the
13 exception of their education for SD profile. It is important to underscore that the current study has
14 no intention to delve into educational aspects. Rather, the main focus is on the development and
15 psychometric properties of the SCQ. In the current study, a total of 638 students, aged 18-19
16 years, voluntarily participated. The sex ratio of boys/girls was 0.81. Since all students were aged
17 at least 18, they could decide for themselves whether or not to participate in the study. The
18 response rate was 93%. Of the students who did not participate, a few had technical problems
19 with the online questionnaire, and the rest had other activities (e.g., exams and tests) to do at the
20 time of the semester when the study took place. We observed small amounts of missing data,
21 with 2.8% of the respondents missing one or more items. Missing data was handled using the
22 Mplus default approach (Muthen & Muthen, 2010). The data were collected in the schools during
23 normal school hours. The participating students completed an online version of the questionnaire
24 and, in cases where computers were not available in the classroom, a paper version was used,
25 from which data were transferred to the online version at a later stage. During the administration
26 of the survey in the school setting, a researcher was always present. In this way we ensured the
27 reliability of the data collection process, and that the same information was given to all the
28 participants. A week before the visit, the students were provided with a passive consent form
29 concerning the study.
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39 **4. Results**

40 **4.1. Factor structure of the long version of the SCQ**

41 We performed a series of confirmatory factor analyses to test the hypothetical model shown in
42 Figure 2. Given that we were specifically looking to confirm this model, we did not opt for
43 exploratory factor analytical techniques, but explicitly tested the model that was built through
44 theory, and intended to show the factor structure as hypothesized. As a first step, we inserted all
45 50 items into a higher order factor model as presented in Figure 3. The logic here is that the third
46 order latent construct, sustainability consciousness, is composed of three underlying (second
47 order) latent constructs, namely sustainability knowingness, sustainability attitudes and
48 sustainability behaviors. Each of the second order constructs was composed of three first order
49 constructs relating to one of the three pillars of SD: the environmental, social and economic ones.
50 In the first step, we modeled all the items and all the constructs at the same time, including all
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three orders of latent construct. We included error corrections for the nested nature of the data (students clustered within schools). Fit indices indicated an unacceptable fit of the model to the data (RMSEA=0.057; CFI=0.799; TLI=0.788). One item was identified as problematic, with a non-significant factor loading (K1: “*Economic development is necessary for sustainable development*”), and was omitted from the analyses, after which we re-estimated the model with the 49 remaining items, which improved the model (RMSEA=0.052; CFI=0.867; TLI=0.850).

To further increase the model fit, we estimated modification indexes in three separate smaller CFAs, one for each second order latent construct (knowingness, attitudes and behaviors). We used the modification indexes to identify those error covariance estimates that would improve the models, starting with the highest estimated impact of the modification on the model fit. We only included those estimates that indicated covariance between the errors of items within a single lower order latent construct (environmental, social, economic). The procedure resulted in the inclusion of eight error covariances: two within the sustainability knowingness construct (K9-K10, and K20-K21), two within the sustainability attitudes construct (A5-A19, and A6-A13), and four within the sustainability behaviors construct (B3-B10, B4-B14, B14-B17, and B4-B17), as shown in Figure 3.

After establishing a good model fit for the three second-order models, we progressed to the third step: the re-estimation of the third-order CFA. To do this, we combined the three second-order models – including the error covariances – into a single model, which joined them together under the umbrella construct of sustainability consciousness. The final model showed an almost totally acceptable fit to the data (RMSEA=0.033; CFI=0.921; TLI=0.917). It should be noted that these indexes do not suggest an excellent model fit, and that the modification indices do not suggest any meaningful improvement to the model.

Table 2 shows all the items in the long version of the SCQ. The factor weights in Table 2 are standardized. Figure 3 shows the factor structure and the error covariances of the final model for the long version of the SCQ; it also includes the estimates for the structural parameters in the model.

[Please insert Table 2 here]

[Please insert Figure 3 here]

4.2 Creating a short version of the questionnaire

We continued the modeling process by creating a short version of the questionnaire with two main intentions: to increase the model fit even more, and to render the questionnaire into an easy-to-use and quick survey instrument. The next step was, therefore, to reduce the number of items in the SCQ. In a first (data-driven) phase of the item reduction process, we selected the three items with the highest factor loading (27 items in total) for each of the first-order constructs. A

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3 CFA for the third-order model with the reduced number of items was fitted to test the construct
4 validity of this new version of the instrument. The model showed an excellent fit to the data
5 (RMSEA=0.041; CFI=0.953; TLI=0.944).
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7 Given that the UNESCO framework for SD was the leitmotiv for the development of the
8 SCQ items, we checked the extent to which the SCQ-S covered the topics in the framework. The
9 results of this analysis showed that, in the short version of the questionnaire, all topics were
10 covered except for three: topic 6 (HIV/AIDS - we considered the items within the sub-theme of
11 health to cover this topic); topic 10 (rural development - which as defined by UNESCO, and as
12 argued for in the introduction, is not applicable to a Swedish or Western context) and topic 12
13 (disaster prevention and mitigation). This led us to replace one item within the sustainability
14 knowingness construct: K4 was replaced by K21, to also include topic 12 (disaster prevention).
15 Table 3 shows how the SCQ-L and SCQ-S cover the topics in the UNESCO definition for SD. In
16 a final step, we ran a CFA for the model with the replaced items, which again showed an equally
17 excellent model fit (RMSEA=0.041; CFI=0.953; TLI=0.944). Table 4 shows the 27 items in the
18 final model of the SCQ-S. The factor structure is shown in Figure 4. Factor weights in Table 4
19 and Figure 4 are standardized. Analyses using raw data and latent estimated respectively show
20 that the short and long version of all the scales are highly correlated, with all Pearson's r -values
21 between .82 and .95, and all phi-values between .83 and .95.
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29 [Please insert Table 3 here]
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37 **5. Conclusion and implications**

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39 Based on the described development and validation processes of the SCQ, we would argue that
40 we have provided a set of two valid and reliable instruments (SCQ-L and SCQ-S) according to
41 both theoretical and psychometric standards. Consequently, these instruments will be of use for
42 the research community at large and for the sustainability research community specifically. As
43 discussed above, the questionnaires fill an important gap since there has been no comprehensive,
44 holistic and validated instrument available prior to these. We think that the SCQ can be used in
45 many different contexts, such as studying educational effectiveness, the implementation of
46 sustainable efforts in organizations, and the impact of policies on the consciousness of citizens,
47 etc. The possibilities are plentiful. **Both the SCQ-L and SCQ-S can be used to (amongst others)**
48 **evaluate individual-level outcomes of policy, communication and education initiatives. This**
49 **would require repeated measurement of the constructs over time, or during different measurement**
50 **occasions spanning such initiatives. Differences in (aggregated) scores will then provide**
51 **feedback on the outcomes of initiatives in terms of changes in (groups of) individuals' SC in**
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3 general, or (depending on the version of questionnaire / sub-scales used) their knowingness,
4 attitudes and/or behaviors.
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6 We have developed a long (SCQ-L) and a short (SCQ-S) version of the instrument. The
7 reason for this is that when evaluating the effect of the implementation efforts of education for
8 SD in the Swedish school system (Authors, 2014, Authors, 2015a,b,c; Authors, 2016) in our own
9 studies with the instrument, we experienced the access to respondents as one of the most difficult
10 hurdles to overcome due to time shortages. This is also found to be a barrier in questionnaire
11 studies in the literature (e.g., Boynton & Greenhalgh, 2004). By developing a short questionnaire,
12 we have provided an instrument for overcoming this problem. The short version is most suitable
13 in large-scale studies evaluating the first (SC) and second levels (sustainability knowingness,
14 sustainability attitudes and sustainability behavior) of the construct. Another advantage with the
15 SCQ-S is that fewer questions increases the probability of the respondents staying focused while
16 answering the questionnaire. In consequence, we would recommend using the long version of the
17 questionnaire if the aim is to research the third level of the construct (A_{ENV} , A_{SOC} , A_{ECO} , B_{ENV} ,
18 B_{SOC} , B_{ECO} , K_{ENV} , K_{SOC} , K_{ECO}), or when more descriptive data related to the sub-themes is of
19 interest.
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24 We see three possible approaches to using scale scores to this end. The most relevant
25 approach to use depends on the issues raised and expertise present with the user of the
26 instrument. The first possibility is the calculation of simple mean values (and standard
27 deviations) across the items for each scale. Our results show that this is a meaningful approach
28 (all Cronbach's alpha values indicate internal consistency) both at the level of SC, and the sub-
29 constructs knowingness, attitudes and behaviors. This goes for the long and the short version.
30 Users would in this scenario for example use mean values across all the knowingness items of the
31 short version to generate and aggregate score for individual respondents' knowingness. This
32 would probably be the most straightforward way to use the scale. Like in all instruments based on
33 items there is, however, also the possibility to take into account the differential weights of each of
34 the items within the construct(s). The second possibility is therefore to correct item values for
35 their weight (regression coefficient or factor loading) derived from the CFA. In this approach, a
36 user would multiply each of the e.g. short version knowingness item scores with the factor
37 loading, and then calculate the weighted-mean over all the items as the aggregate score for an
38 individual's knowingness score. The third option, then, goes even one step further and also take
39 into account the fact that different items have different residual error. This can be corrected for by
40 not calculating aggregate scores but through the use of the latent constructs in a SEM analysis.
41 Our current results show that the first, most straight forward option is appropriate (given that we
42 have illustrated the validity and reliability of all sub-scales), but we would recommend users to
43 examine which of the three options is most suited to fulfill their specific needs.
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51 It should also be considered that the questionnaire has been developed and validated in
52 the context of Sweden, i.e., a Western society. Therefore, caution should be exercised in terms of
53 using the instruments in other contexts. In a next phase, it would be interesting to test the validity
54 and reliability of both versions of the SCQ in different cultural contexts. Another prioritized
55 study would be to test for different age groups, since a previous study has found indications that
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3 older individuals might be more likely to engage with nature, avoid environmental harm, and be
4 more reluctant to use natural resources (Wiernik, Ones & Dilchert, 2013), and these themes relate
5 to some of the items in the SCQ. However, the utility of the instrument has already been proven
6 in other studies in which predictive validity has been shown. We found that students experiencing
7 a teaching approach that includes a holistic approach (i.e. subject integration) yielded higher
8 sustainability knowingness, and students experiencing a teaching approach including pluralism
9 (critical thinking, using different perspectives, etc.) predicted higher levels of self-reported
10 sustainability behavior (author et al., 2015a). **To investigate effects on actual behavior, additional
11 studies using methodology that is more direct is also needed.**
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15 When comparing the SCQ with the point of departure of this study, i.e., the questionnaire
16 created by Michalos et al. (2012), the end product is very different. First, turning to the SCQ-L,
17 11 items of the Michalos et al. questionnaire were removed, and four new items were added. Of
18 those remaining, all but two were reformulated. Moreover, the structuring of the items according
19 to the concept of SC is novel, and central to this study. In the structuring, the construct of
20 knowledge was changed into knowingness by removing the factual knowledge items and
21 reformulating the others. Moreover, the coding of the items into the SD-dimensions
22 (environment, economy and society) is novel. In the papers by Michalos et al. (2012) they used
23 their data to calculate an index withholding all items without structuring the items in different
24 dimensions or levels according to a theoretical framework. The reduced version, SCQ-S, is
25 evidently even less comparable with the Michalos et al. questionnaire. To summarize, we would
26 claim that the SCQ is theory driven, and a novel, empirically-sound instrument.
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31 SC, and its operationalization into the SCQs, is an enlargement of the concept of
32 environmental consciousness (Jiménez Sanchez & Lafuente, 2010; Sharma & Bansal, 2013) in
33 the way that the social and economic dimensions are integrated. Through relating SC to the three-
34 ring construct of SD, it not only related closely to the UNESCO framework, but also to the more
35 recent 17 sustainable development goals proclaimed in the Global Action Program (GAP) of the
36 UN (UN, 2015). In this way, the SCQ can be expected to be long-lasting, because the three-ring
37 model has been the benchmark for sustainability efforts over the last twenty years, and is planned
38 also to be so in the coming decades within the framework of the GAP (UN, 2015; UNEP, 2015).
39 This being the case, the SCQ would be ideally suited for longitudinal studies as a way of
40 following long-term trends.
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44 One construct with many similarities with SC is *Sustainability Citizenship*. Sustainability
45 citizenship, or sustainable citizenship as it is also synonymously termed, has predominantly been
46 referred to within the political, business and educational sciences, as an adjective to describe a
47 responsible person or organization that, based on its own incentives, has the capability to act in
48 line with SD (Berry, 2005). In the influential book by Dobson (2011), it is argued that attitudes
49 are important for behavior changes in the long term, to also make lasting changes at the personal
50 level in favor of SD. Huckle (2013) argued in line with Dobson that sustainability citizenship
51 should be looked upon as those rights and, even more so, those duties, that a citizen should be
52 considered obliged to live by while contributing to a more sustainable world. Micheletti and
53 Stolle (2012) pointed out that sustainable citizenship involves an understanding of citizenship as
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3 a total practice of responsibility between individuals and their political, social, economic and
4 natural environment. Considering these descriptions, we would argue that there are many
5 similarities between SC and sustainability citizenship (and sustainable citizenship), although
6 nobody has defined or operationalized sustainability citizenship in such a detailed matter as we
7 did in this paper with regard to SC. The most important difference between the concepts as we
8 understand them is that sustainability citizenship is more often viewed as a goal for persons to act
9 upon, or a characteristic of organizations, while SC as defined and operationalized by us, can be
10 understood more as a latent capacity within individuals to act in a pro-sustainable way.
11 Therefore, we would consider that SC is a good measurement or indicator for the acceptance of
12 sustainability citizenship as a norm within individuals, or a group of individuals, or an
13 organization. In that way, we would also encourage fellow researchers to use SCQ while further
14 investigating and operationalizing sustainability (and sustainable) citizenship. So far, no
15 comprehensive instrument is available for measuring sustainability citizenship. There only exist
16 partial questionnaire items measuring political consumer behavior, see for example Micheletti,
17 Stolle and Berlin (2012). Therefore, SC and the SCQs also offer the possibility of filling a gap in
18 the research concerning sustainability citizenship.
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Tables:

Table 1. The number of items spread across constructs and dimensions of SD

	Knowingness	Attitudes	Behavior	Total
Environmental	6	4	7	17
Economic	5	4	4	13
Social	8	6	6	20
Total	19	14	17	50

Table 2. The long version of the sustainability consciousness questionnaire (SCQ-L), with descriptive and properties for the nine factors and 49 items.

SCQ-L			Factor weight	M	SD
Sustainability knowingness ($\alpha=0.82$)					
	K3	Reducing water consumption is necessary for sustainable development	0.512	3.76	1.38
	K4i	Preserving nature is <i>not</i> necessary for sustainable development.	0.571	4.58	0.80
	K7	Sustainable development demands that we humans reduce all sorts of waste.	0.500	4.20	0.97
Env ($\alpha=0.91$)	K14	Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity).	0.665	4.56	0.62
	K18	Sustainable development requires a shift to renewable natural resources.	0.702	4.30	0.90
	K21	For sustainable development, people need to be educated in how to protect themselves against natural disasters.	0.503	3.67	1.29
Soc ($\alpha=0.88$)	K2	Improving people's chances for a long and healthy life contributes to sustainable development.	0.451	3.94	1.07
	K5	A culture where conflicts are resolved peacefully through discussion is	0.664	4.35	0.83

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		necessary for sustainable development			
	K8	People who exercise their democratic rights are necessary for sustainable development (for example, they vote in elections, involve themselves in social issues, express their opinions)	0.602	4.16	0.99
	K9	Reinforcing girls' and women's rights and increasing equality around the world is necessary for sustainable development.	0.802	4.10	1.09
	K10	Respecting human rights is necessary for sustainable development	0.768	4.41	0.78
	K11	To achieve sustainable development, all the people in the world must have access to good education	0.756	4.53	0.60
	K15	Having respect for other cultures is necessary for sustainable development.	0.660	4.14	1.07
	K20	For sustainable development, major infectious diseases such as HIV/AIDS and malaria must be stopped.	0.576	3.89	1.08
	K12	Sustainable development requires that companies act responsibly towards their employees, customers and suppliers	0.531	4.23	0.80
	K16	Sustainable development requires a fair distribution of goods and services among people in the world	0.729	4.06	1.03
Eco ($\alpha=0.95$)	K17	Wiping out poverty in the world is necessary for sustainable development	0.654	4.04	1.22
	K19	Sustainable development demands that people understand how the economy functions.	0.359	3.80	1.00
Sustainability attitudes ($\alpha=0.73$)					
	A5i	I think that using more natural resources than we need does <i>not</i> threaten the health and well-being of people in the future	0.550	4.50	0.85
Env ($\alpha=0.82$)	A6	I think that we need stricter laws and regulations to protect the environment	0.704	4.23	0.90
	A10	I think that it is important to take measures against problems which have to do with climate change	0.816	4.56	0.54
	A19i	I think it is okay that each one of us uses as much water as we want.	0.529	3.39	1.26
	A1	I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably	0.700	4.46	0.50
	A2	I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today	0.657	4.64	0.53
	A11	I think that the government should provide financial aid to encourage more people to make the shift to green cars.	0.437	3.93	1.07
Soc ($\alpha=0.82$)	A13	I think that the government should make all its decisions on the basis of sustainable development.	0.610	3.82	1.14
	A14	I think that it is important that people in society exercise their democratic rights and become involved in important issues.	0.572	4.22	0.94
	A18	I think that women and men throughout the world must be given the same opportunities for education and employment	0.701	4.74	0.44
	A3	I think that companies have a responsibility to reduce the use of packaging and disposable articles	0.642	4.43	0.75
Eco ($\alpha=0.93$)	A7	I think it is important to reduce poverty	0.774	4.54	0.66
	A8	I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries	0.658	4.27	1.06
	A16	I think that people who pollute land, air or water should pay for the damage they cause to the environment.	0.486	4.21	0.99
Sustainability behaviors ($\alpha=0.79$)					
Env ($\alpha=0.88$)	B1	Where possible, I choose to cycle or walk when I'm going somewhere, instead of travelling by motor vehicle.	0.405	3.64	1.31

	B2	I never waste water.	0.296	2.44	1.13
	B3	I recycle as much as I can	0.670	3.53	1.61
	B7	I pick up rubbish when I see it out in the countryside or in public places.	0.536	2.52	1.26
	B8i	I don't think about how my actions may damage the natural environment.	0.475	3.69	1.19
	B10	I always separate food waste before putting out the rubbish when I have the chance	0.676	3.76	2.20
	B12	I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials)	0.796	3.12	1.71
Soc ($\alpha=0.84$)	B4	When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life	0.635	3.93	1.78
	B5i	I often make lifestyle choices which are not good for my health.	0.158	3.19	1.24
	B13	I work on committees (e.g., the student council, my class committee, the cafeteria committee) at my school.	0.458	2.24	1.39
	B14	I treat everyone with the same respect, even if they have another cultural background than mine.	0.604	4.53	.89
	B15	I support an aid organization or environmental group	0.666	2.51	2.46
	B17	I show the same respect to men and women, boys and girls	0.634	4.73	0.50
Eco ($\alpha=0.90$)	B6	I do things which help poor people	0.535	2.70	1.42
	B9	I often purchase second-hand goods over the internet or in a shop	0.482	2.30	1.76
	B11	I avoid buying goods from companies with a bad reputation for looking after their employees and the environment	0.642	2.97	1.72
	B16	I watch news programs or read newspaper articles to do with the economy.	0.200	3.06	1.42

NOTE that item codes including an "i" in the second column are inverted, i.e. A5i, K4i, B5i

Table 3. UNESCO topics coverage of the SCQ-L and SCQ-S

Domain	Topic	Total		K		A		B	
		SCQ-L	SCQ-S	SCQ-L	SCQ-S	SCQ-L	SCQ-S	SCQ-L	SCQ-S
SOC	1	2	2	2	2				
	2	2	2	1	1			1	1
	3	3	2	1		1	1	1	1
	4	6	4	2	1	2	2	2	1
	5	3	1	1		1	1	1	
	6	1		1					
	7	6	1	1		3		2	1
ENV	8	13	7	5	2	3	2	5	3
	9	2	1				1	1	
	10								
	11	2	1					2	1
	12	1	1	1	1				
ECO	13	4	4	2	2	1	1	1	1
	14	8	5	2	1	3	2	3	2

	15	3	2	2	1	1	1
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Table 4. The short version of the sustainability consciousness questionnaire (SCQ-S), with descriptives and properties for the nine factors and 27 items.

SCQ-S		Factor weight	<i>M</i>	<i>SD</i>	
<i>Sustainability knowingness</i> ($\alpha=0.70$)					
Env	K3	Reducing water consumption is necessary for sustainable development	0.453	3.76	1.38
	K14	Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity)	0.617	4.56	0.62
	K21	For sustainable development, people need to be educated in how to protect themselves against natural disasters.	0.416	3.67	1.29
Soc	K5	A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development	0.677	4.35	0.83
	K10	Respecting human rights is necessary for sustainable development	0.668	4.41	0.78
	K11	To achieve sustainable development, all the people in the world must have access to good education	0.812	4.53	0.60
Eco	K12	Sustainable development requires that companies act responsibly towards their employees, customers and suppliers	0.514	4.23	0.80
	K16	Sustainable development requires a fair distribution of goods and services among people in the world	0.722	4.06	1.03
	K17	Wiping out poverty in the world is necessary for sustainable development	0.644	4.04	1.22
<i>Sustainability attitudes</i> ($\alpha=0.78$)					
Env	A5i	I think that using more natural resources than we need does <i>not</i> threaten the health and well-being of people in the future	0.555	4.50	0.85
	A6	I think that we need stricter laws and regulations to protect the environment	0.701	4.23	0.90
	A10	I think that it is important to take measures against problems which have to do with climate change	0.821	4.56	0.54
Soc	A1	I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably	0.744	4.46	0.50
	A2	I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today	0.692	4.64	0.53
	A18	I think that women and men throughout the world must be given the same opportunities for education and employment	0.751	4.74	0.44
Eco	A3	I think that companies have a responsibility to reduce the use of packaging and disposable articles	0.638	4.43	0.75
	A7	I think it is important to reduce poverty	0.808	4.54	0.66
	A8	I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries	0.683	4.27	1.06
<i>Sustainability behaviors</i> ($\alpha=0.72$)					
Env	B3	I recycle as much as I can	0.612	3.53	1.61

	B10	I always separate food waste before putting out the rubbish when I have the chance	0.617	3.76	2.20
	B12	I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials)	0.826	3.12	1.71
	B4	When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life	0.860	3.93	1.78
Soc	B15	I support an aid organization or environmental group	0.649	2.51	2.46
	B17	I show the same respect to men and women, boys and girls	0.875	4.73	0.50
	B6	I do things which help poor people	0.506	2.70	1.42
Eco	B9	I often purchase second-hand goods over the internet or in a shop	0.486	2.30	1.76
	B11	I avoid buying goods from companies with a bad reputation for looking after their employees and the environment	0.670	2.97	1.72

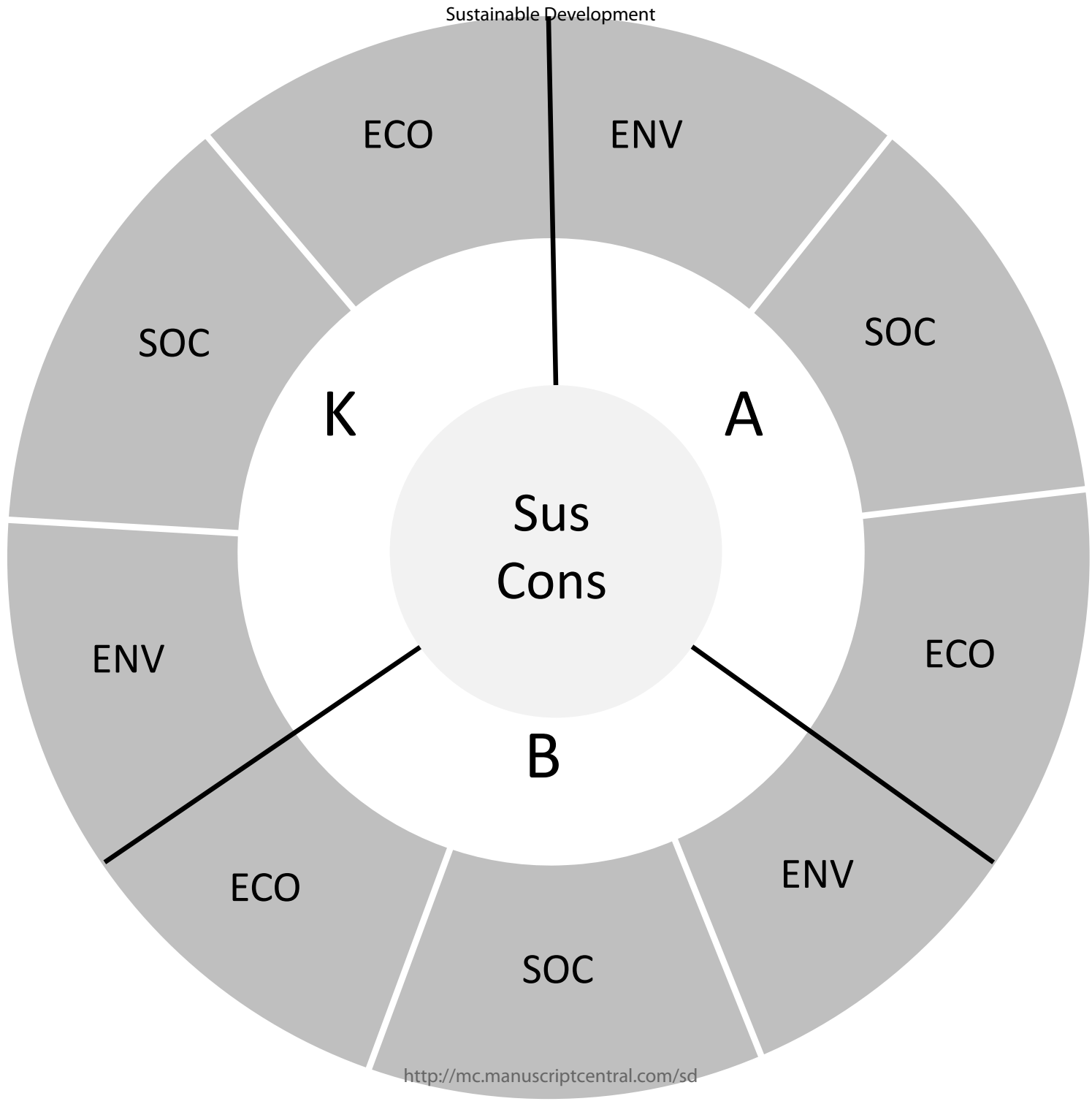
NOTE that item codes including an "i" in the second column are inverted, e.g., A5i

Figure legends:

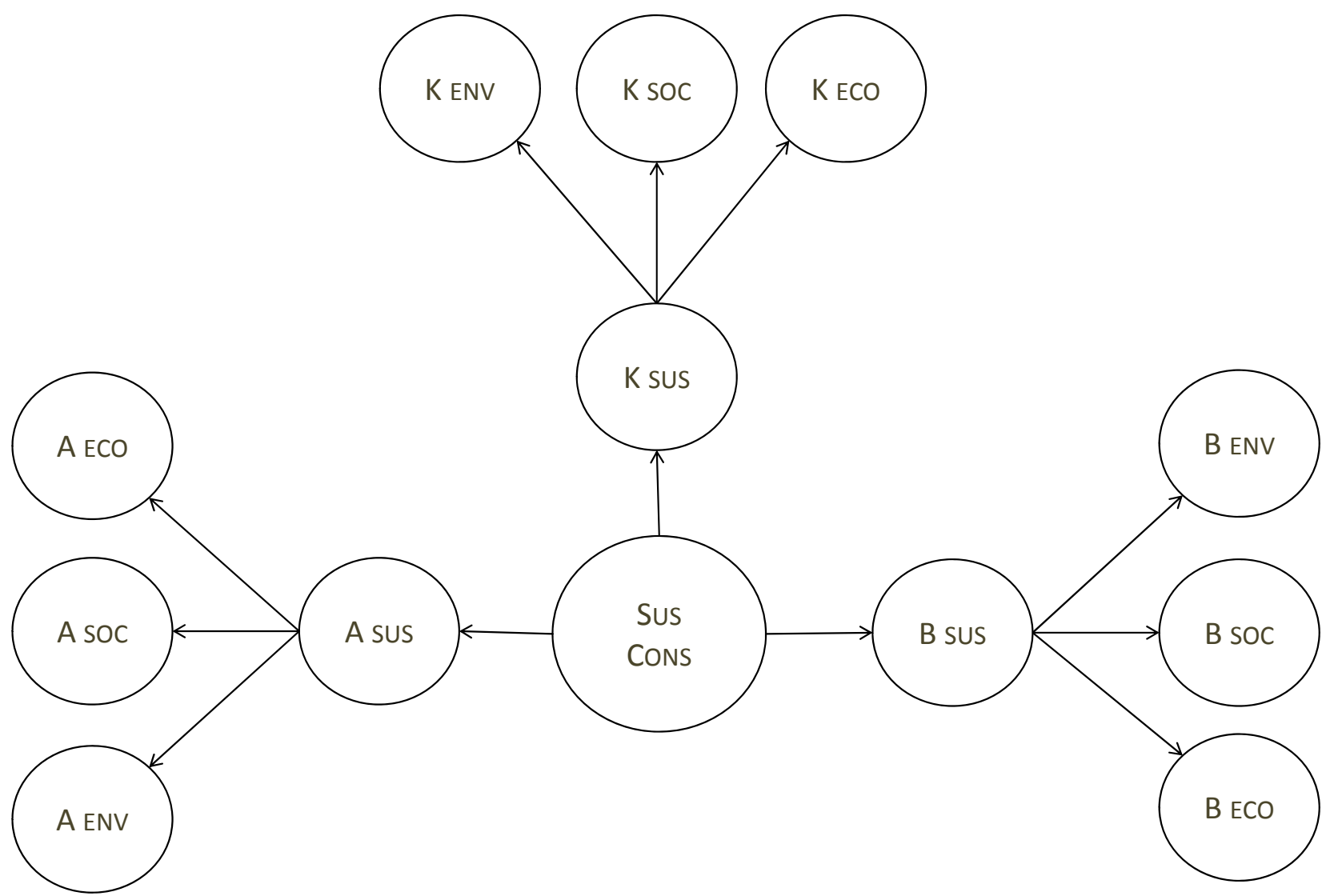
Figure 1. Conceptual representation of Sustainability Consciousness. K=knowingness; A=attitudes; B=behaviors; ECO=economic; SOC=social; ENV=environmental; Sus Cons=Sustainability Consciousness.

Figure 2. Theorized three-order model of Sustainability Consciousness constructs. K=knowingness; A=attitudes; B=behaviors; ECO=economic; SOC=social; ENV=environmental; SUS Cons=Sustainability Consciousness.

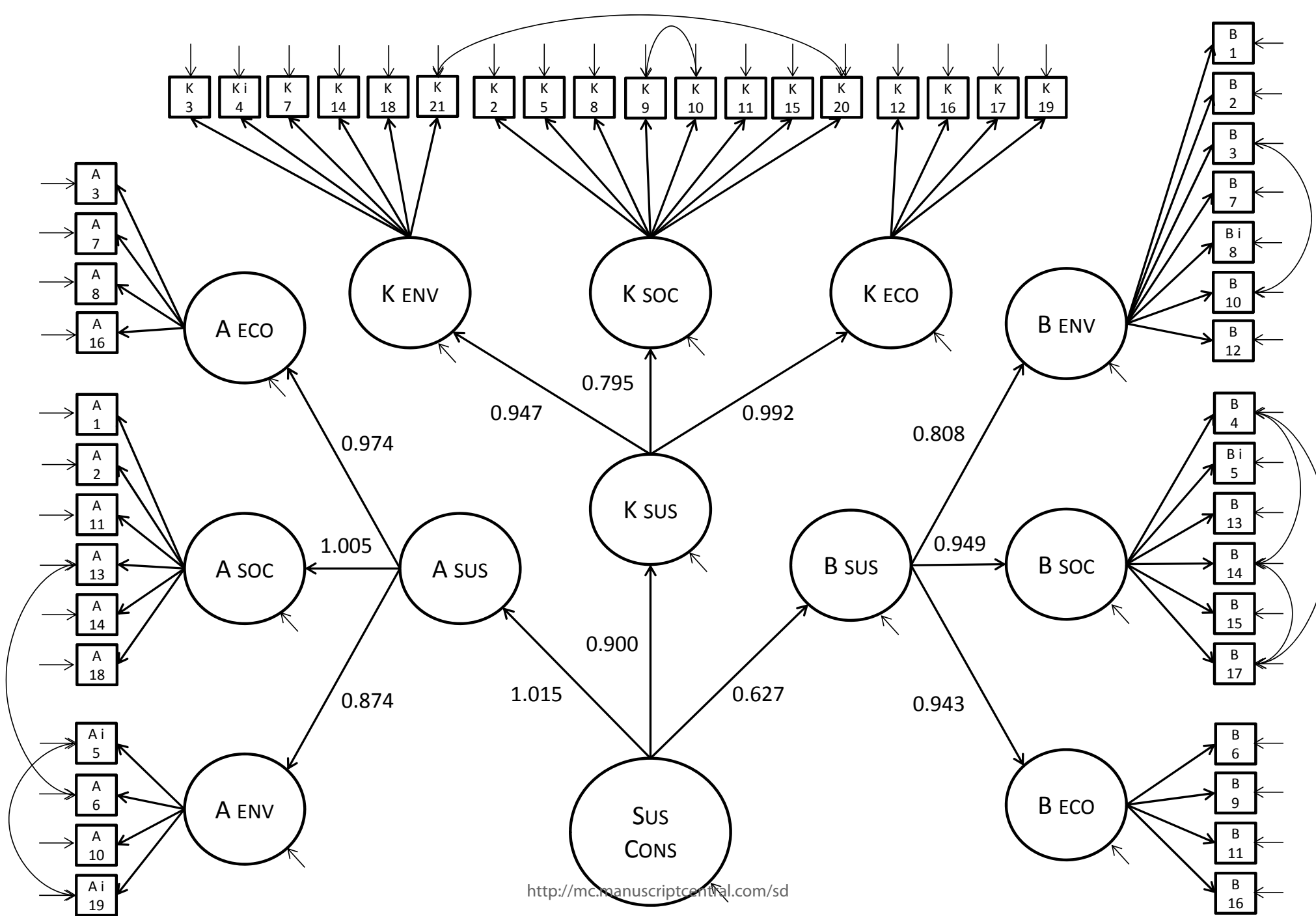
Figure 3. The factor structure of the SCQ-L (top) and SCQ-S (bottom). K=knowingness; A=attitudes; B=behaviors; ECO=economic; SOC=social; ENV=environmental; SUS CONS=Sustainability Consciousness.

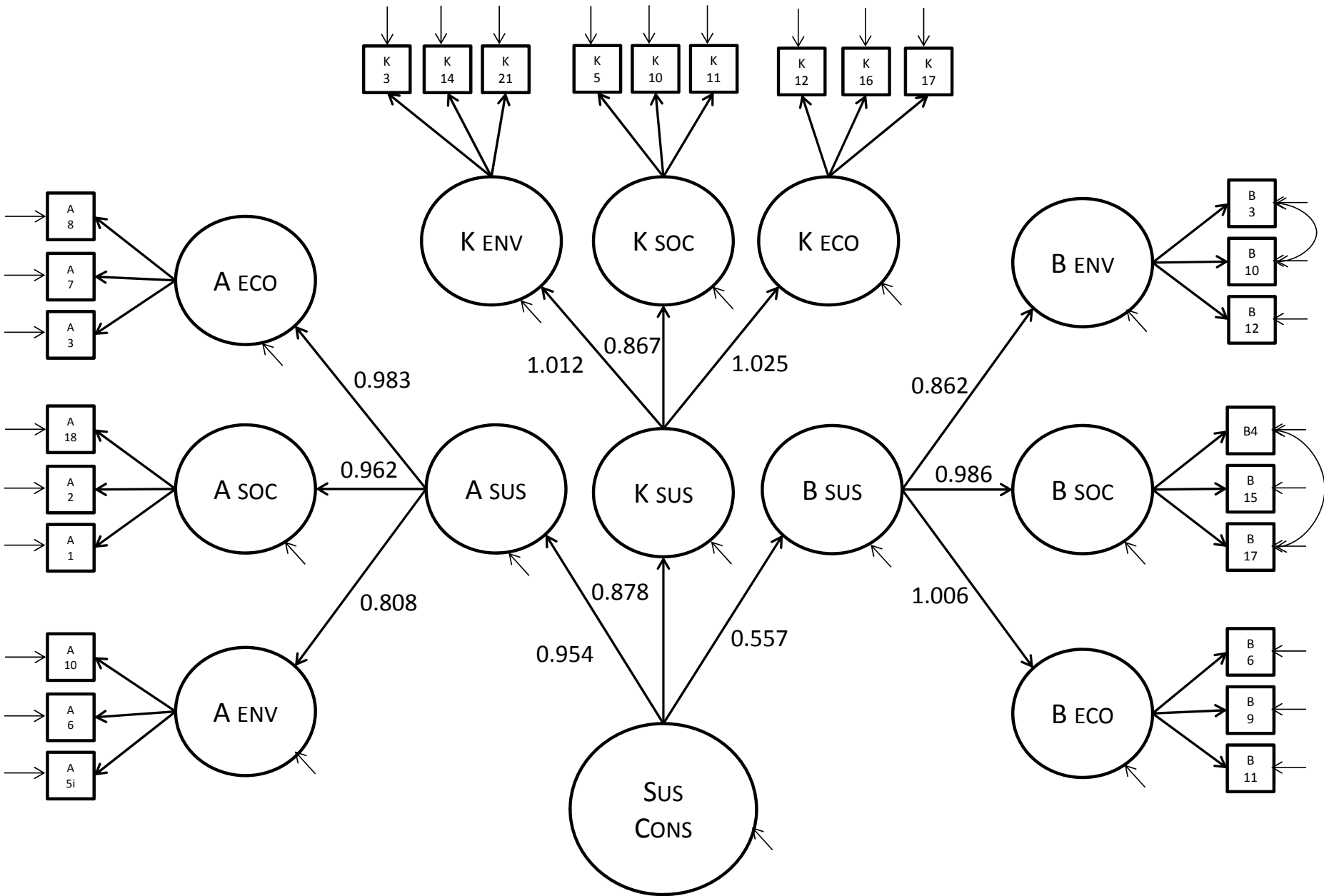


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