

# Ethical Perception of a Digital Study Assistant: Student Survey of Ethical Values

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**Abstract:** The digital transformation in higher education progresses constantly. Here, new technical innovations are emerging, such as a digital study assistant (DSA). The DSA is designed to help students to identify and achieve their personal study goals. In this regard, it should be noted that ethical considerations play an increasingly important role in the introduction of digital systems and thus also in the DSA. Therefore, the user-centered perspective is taken into account in the development of a DSA by addressing personal ethical values. For this purpose, two consecutive surveys were conducted with 42 and 156 students from a German university. The aim of the work is to identify ethical values in relation to the DSA that were perceived as particularly important by students as the main user group. From this, practical implications and further research possibilities regarding DSAs and ethical issues can be derived.


## 1 INTRODUCTION


Progressive digitalization has made a major impact on society in the twenty-first century. The way in which people communicate, exchange information, develop and understand disciplinary knowledge has changed dramatically with the development and availability of digital technologies (Ihme and Senkbeil, 2017). As a result, digital innovations have developed far-reaching effects on our moral life and thus on current ethical issues of digitalization that need to be addressed (Floridi, 2010). This is where our study comes in, as we want to take a closer look at the ethical perception of a digital study assistant in a higher education context from a student's point of view. In doing so, the interests of a heterogeneous student body must be given special consideration (Allemann-Ghionda, 2014).


In addition to digitalization, the academic landscape has been shaped by the internationalization of study structures, the increasing permeability of the education system, and the pluralization of lifestyles (Zervakis and Mooraj, 2014). Decision-makers are therefore confronted more than ever with the question of the direction in which universities should develop

in order to meet new challenges (Heuchemer, 2018). To support students efficiently and effectively in achieving their individual educational goals, the development of virtual assistants or so-called digital study assistants (DSA) has therefore become increasingly important (Alexander et al., 2019).

The development, implementation, and evaluation of such a DSA have been taking place since November 2018 within the framework of the joint project SIDDATA. The digital assistant is intended to support students in their actions based on a situation analysis and give them recommendations for achieving predefined goals. Such a digital study assistant can help to realize a wide range of potentials, both on the institutional side and on the students' side. Academic institutions can better understand the learning needs of their students and positively influence their learning and their learning progress (Slade and Prinsloo, 2013). The choice of modules and periods of study abroad can be made easier for students by providing information in line with their interests. In addition, it has been shown that chat offers, for example, can be used as an autonomous learning instrument (Benotti et al., 2014; Dutta, 2017; Abbasi and Kazi, 2014). The basis for this is

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comprehensive data access from students, through which the systems can provide decision support according to user preferences. It seems to be valuable that a better understanding of the student body has a number of advantages. However, the collection and use of personal data can lead to various moral, political, and economic dilemmas (Munoko et al., 2020). It is therefore essential to address issues of privacy, security, self-determination, and justice at an early stage (Manzeschke, 2020). In the field of digital technologies, different ethical concepts can be found, depending on the research topic, which partly overlaps, like computer ethics as a separate part of technical ethics (Johnson and Miller, 2009; Moor, 1985). Further ethical areas in this field are machine ethics (Anderson and Anderson, 2011), robot ethics (Lin and Abney, 2017), and information ethics (Floridi, 2015). Although ethics is regarded by many experts as an integral part of technology assessment, there is a great need for further research in this context, for example, for measures of ethical attitudes or frameworks for ethical impact assessment (Wright, 2011; Masrom et al., 2010; Harris et al., 2011; Millar, 2016). Therefore, the aim of this study is to identify ethical values that are considered important for students as the central stakeholder group for the DSA. For this reason, the following research questions are posed:

**RQ1:** *Which ethical values are considered important by students in relation to a DSA?*

**RQ2:** *What correlations can be found between the ethical values mentioned by students?*

## 2 THEORETICAL FOUNDATION

### 2.1 Digital Study Assistants as Part of Digital Transformation

As a result of the constantly growing opportunities to use digital innovations, the level of digitalization at universities is also increasing analogously. Technological progress in recent years made it possible to bundle a large amount of student data. Students have access to a wide variety of digital resources, are increasingly networking online, and are interacting more and more on a wide variety of digital platforms (Ihme and Senkbeil, 2017). In order to be able to use student data to their advantage, technologies such as assistance systems (e.g. DSA) and learning analysis are becoming more and more important for the future development of universities. They are associated with a number of positive effects for students, professors, and the universities. As

Rouse already pointed out, technological changes are closely related to transformation (Rouse, 2005). The term digital transformation (DT) conquers the modern world and describes the use of new digital technologies to enable major improvements (Fitzgerald et al., 2013). These technologies are not new per se, it is often more about the combinations and evolving possibilities that create a new innovation like it is the case with the SIDDATA project. DT is regarded as a major change in society and business and is often described as an ongoing process (Morakanyane, 2017). DT is an important and contemporary issue in academic education and cannot be neglected in the context of a digital study assistant (Gottburgsen and Wilige, 2018). Changing learning conditions in the age of digitalization must be perceived for further implementation in order to interact dynamically and flexibly (Ahel and Lingenau, 2020). New technologies in higher education require a certain level of user acceptance in order to be able to sustainably survive on the market and above all to guarantee long-term added value for students and other stakeholders (Mukerjee, 2014). Various challenges like the internationalization of study structures or the increasing permeability of the education systems (Zervakis and Mooraj, 2014) are putting academic institutions under great pressure. Traditional approaches must be reconsidered and replaced or supplemented by new ideas. It is therefore important that higher education institutions are supported by the academic community in the development of new business models and the implementation of innovation (Hold et al., 2017).

In recent years, the development of digital assistance systems in particular has gained enormous importance in the field of business informatics, this is shown in the latest NMC Horizon Report. The NMC Horizon Report from 2014 and 2019 lists virtual assistants as one of six important future technologies in the context of higher education (Alexander et al., 2019; Johnson et al., 2014). This refers especially to cognitive assistance systems with regard to the provision of information and communication. These serve above all to provide application-oriented information in work and learning processes (Apt et al., 2018). The aim of DSAs is to support students in their actions through a situation analysis and to give them recommendations for achieving predefined goals. In digitalization, however, there are more extensive possibilities and potential uses for the development of such systems. Central capabilities of digital assistance systems at the current state of research are environmental perception, reactive behavior, attention control, and situation

interpretation. In the future, assistance systems should offer adaptive, situational, and individualized support using sensory detection of the user and context (Apt et al., 2018). A DSA could, for example, react to requests from learners and support students in their everyday study routine. Such a system could support staff in advising and informing students and teachers with specific didactic and organizational tasks. Students could be supported in the self-organization of their studies in the form of a "reflection partner" (Schmohl and Schäffer, 2019).

The project SIDDATA seeks to examine whether and how students can be efficiently and effectively assisted in achieving individual educational goals by bringing together previously unrelated data and information in an individual DSA. The use of the DSA is intended to encourage students to define and consistently pursue their own educational goals. In the future, the data-driven environment should be able to provide situation-appropriate hints, reminders, and recommendations, including local as well as externally offered courses and Open Educational Resources (OER). In this project, in addition to the development of the mentioned functions, ethical considerations also play a key role in order to meet the requirements of the students. The DSA is initially implemented and evaluated at three universities. Students should be encouraged to define and consistently pursue their own study objectives, and to be supported by a data-driven environment. The implementation of a DSA requires technical guidelines at the strategic level for a structured approach by universities to adapt to these changes (Leal et al., 2020). It is also important to consider user acceptance, e.g. through consideration of ethical aspects, to ensure sustainable use by students, teachers, and employees of organizational departments of a university (Hirsch-Kreinsen et al., 2015).

## 2.2 Ethics in Digital Technologies

Due to the progressing digitalization in higher education, the question is becoming more relevant according to which moral and ethical standards digital technologies are developed and used. For this reason, the investigation of moral and ethical norms or phenomena in digitalization, even a separate ethics branch, the information and computer ethics, was established. According to Pardon and Siemens, ethics in the digital context can be defined "as the systematization of correct and incorrect behavior in virtual spaces according to all stakeholders" (Pardon and Siemens, 2014). Concerns about moral tensions

(Willies, 2014) and ethical dilemmas have been raised in the past. These are associated with the processes of data collection, data mining, and learning analytics implementation (Drachsler et al., 2014; Shum and Ferguson, 2012).

In the research and development of human-technology interaction, ethical aspects are often considered insufficiently or too late (Brandenburg et al., 2018). At the same time, the research, development, and use of innovative technologies have always required ethically responsible action from all stakeholders (Ropohl, 1996). Recent thinking about ethics of information technology (IT) and computer science has therefore focused on how to develop pragmatic methodologies and frameworks. These assist in making moral and ethical values integral parts of research and development and innovation processes at a stage in which they can still make a difference. These approaches seek to broaden the criteria for judging the quality of IT to include a range of moral and human values and ethical considerations. Moral values and moral considerations are construed as requirements for design. This interest in the ethical design of IT arises at a point in time where we are at a crossroad of two developments: first, "a value turn in engineering design" and on the other hand "a design turn in thinking about values" (van den Hoven, 2017). It is assumed that technology is not value-neutral. Value-Sensitive Design (VSD) recognizes that the design of technologies bears "directly and systematically on the realization, or suppression, of particular configurations of social, ethical, and political values" (Flanagan et al., 2008).

The adoption and entry into force of the General Data Protection Regulation of the European Union is a current example of how the protection of personal data and the right to informational self-determination play an important role in regulations and public debates. In the further development of innovative technologies, ethical values should therefore also be anticipated at an early stage and taken into account in the design (Brandenburg et al., 2017). New forms of data analysis, including machine learning, have greatly increased the effectiveness and speed of data analysis in recent years. According to the British Academy and Royal Society, these aspects build the foundation that renders an approach for the use of data indispensable. This foundation represents a key factor for broad acceptance and is therefore an important building block for the success of digital innovations (British Academy, 2018). During the development of a DSA, it is particularly essential to consider the ethical values from the perspective of the

students, as acceptance should be high especially among this stakeholder group. According to the VSD approach to ethics of technology, ethical analysis and moral deliberation should not be construed as abstract and relatively isolated exercises resulting in considerations situated at a great distance from science and technology. Instead, VSD should be utilized at the early stages of the research and development (van den Hoven, 2017). Therefore, this paper focuses on the identification of relevant ethical values from the user's perspective in order to incorporate them into the development process of the DSA at an early stage.

### 3 RESEARCH DESIGN

For this paper, two separately conducted studies were included. The content of these two studies is based on each other, with the results of study 1 being integrated into study 2. First, an exploratory survey was conducted with students (n=42). This survey contains questions about ethical drivers and barriers regarding a potential use of a DSA from the students' perspective. The results of study 1 have a dual function. On the one hand, they already directly depict a result of which ethical values are important to students regarding their use or non-use of a DSA. On the other hand, the results were used as a basis to develop categories which were used for a quantitative survey (study 2, n=156). Figure 1 schematically illustrates the procedure used here.

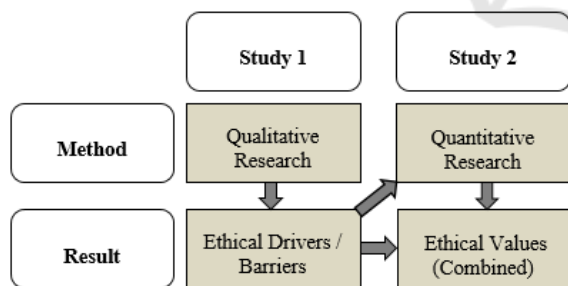


Figure 1: Research Design.

In the next sub-sections, the individual methodological approaches of both studies will be discussed in detail.

#### 3.1 Method – Study 1

An explorative, qualitative short questionnaire in online form was created, which a total of 42 students completed in full. This method was chosen because it

is fundamental in an exploratory procedure to ask opinions and expectations of the participants freely and as unbiased as possible. This survey mode is preferable to an interview approach in the current pandemic situation and at the same time can be carried out independently of the participants' time. The questionnaire started with a welcome text, which also explained the aim of the survey. This was followed by an informational text about the characteristics and goals of a DSA. This information was followed by questions about what the DSA should fulfill from an ethical point of view in order to use it and what ethical barriers would lead students not to use the DSA. The survey addressed students at a German university and for this reason, the survey was conducted in German. Table 1 shows the structure of the questionnaire with the corresponding questions.

Table 1: Structure of the Questionnaire.

Question group	Question	Answer mode
<b>Information text about the DSA</b>		
Ethical drivers	What would be particularly important to you in terms of ethics for long-term use of a digital study assistant?	Free text
Ethical barriers	What ethical barriers would be prohibitive for you to use a digital study assistant?	Free text
Demographics	Please indicate your gender.	Drop-down
	How old are you?	Number
	What field of study are you currently studying?	Free text

Since the questionnaire has a strongly qualitative character due to the free-text answers, a qualitative analysis method was used to evaluate the results. Here, a procedure was chosen that is oriented towards qualitative content analysis (Mayring, 2015). The chosen procedure is divided into four phases. First, the answers were sorted by question and paraphrased (if necessary). Then, the paraphrases were generalized to core sentences at an appropriate level of abstraction (phase 2). In the third phase, the first reduction was made by shortening semantically identical core sentences and those that were not



perceived as contributing significantly to the content. Finally, as the second reduction, the core sentences were combined with similar or identical sentences and thus classified into categories (phase 4).

The sample consisted of students from a German university. Of the 42 respondents, 24 participants classified themselves as female and 15 as male. One respondent stated being diverse and two respondents did not provide any information regarding gender. In terms of the age group of the sample, it was found that nine participants were under 20 years old, in the age group 20-24 there were 18, from 25-29 there were eleven and four participants were over 30 years old. Students from different fields of study also participated in the survey. Students of social sciences were the most represented with 13 participants, followed by education students with eight respondents and students of economics with five participants. Furthermore, natural sciences (four participants), computer science (three participants) and administrative sciences (two participants) were represented. Five participants were assigned to other courses of study and two respondents made no statement in this regard.

The aim of this survey in the first step was to develop ethical value categories that can serve as an indicator of what is important to students from an ethical point of view. In the second step, the categories collected serve as the basis for the subsequent quantitative survey.

### 3.2 Method – Study 2

In order to investigate the ethical values collected from Study 1, a quantitative questionnaire with items, which represent ethical statements, was developed. Consequently, the respondents move within a predefined grid of answer options. In this case, a six-point Likert scale is used. The response options range from “- - - do not agree at all” to “+++ fully agree”. Since the main user group of the DSA are students, the survey is exclusively addressed to enrolled students from a German university, like in study 1. For this reason, the survey was also conducted in German. The aim of this survey was to evaluate the identified ethical values from study 1 in terms of their relevance and importance by the students.

In the beginning, the participants are given an info text on the topic of the survey and motivation. In this context, the students had the opportunity to watch an image film for a better understanding of the DSA and the SIDDATA project. Before starting the questionnaire, the students were given detailed information regarding the goal and content of the

DSA, since they could not be provided with a version of the DSA yet. This should ensure that the students develop an idea about the DSA and that ethical implications arise for them. The questionnaire comprises a total of 15 questions, with the first question being an example question. This example question was intended to familiarize students with the usage of the Likert scale in the survey. For the development of the questionnaire the most named ethical value categories from the qualitative survey were used. Here, for each ethical values, five items were formulated in the first step. Some of the items have been formulated in such a way that they are negatively polarized in order to avoid response patterns. Subsequently, a focus group consisting of six researchers was assigned and reduced the items. The purpose was to select items that best represent the corresponding category of the ethical value (e.g., fairness). This procedure left three items for five categories. Of these remaining items, five have negative polarity. Afterwards, a pre-test was conducted with ten students to check and adjust the comprehensibility and wording of the items. Participants should express their agreement or disagreement with the items by stating their own opinion using the Likert scale. These opinions can provide information about which ethical values, already mentioned in the first study, are also perceived as relevant from the perspective of students in relation to a digital study assistant. Table 2 shows the three Likert items for the fairness category as an example.

Table 2: Items of the Ethical Value Category Fairness.

Question group	Question	Polarity
Fairness	I think fairness towards the users of a digital study assistant is elementary.	Positive
	I would not care if the DSA favored or disadvantaged certain groups of people.	Negative
	If I perceive the DSA to be unfair, then that would be a reason for me not to use the system.	Positive

The questionnaire took an average of approximately 10 minutes to complete, including reading through the info text and watching the image video. The survey was conducted digitally through the survey tool LimeSurvey ([www.limesurvey.org](http://www.limesurvey.org)). A total of 227 enrolled students of the Osnabrück University participated in the survey. Of these, 156

students completed the questionnaire in full. 71 students partially skipped questions or abandoned the survey prematurely. Since the demographic data in Study 1 did not reveal any relevant differences, they were not considered in Study 2. The survey was addressed to all enrolled students at the Osnabrück University and was not limited to a specific semester or department.

Finally, the data were evaluated and analyzed using the statistical program SPSS. Since the Likert scale used in this context does not contain any metric data, it is important for the further processing of the data in SPSS that the response options are transformed. Since the answer "do not agree at all" is a clear statement of complete disagreement, this statement is equated to 0. The other answer options are then rated in ascending order, so that "fully agree" is equated with the highest value of 5. For the negatively worded items, the results were then reversed so that a fully agree (5) equals 0 and a do not agree at all (0) equals a 5. This ensures that the results are presented correctly. SPSS was used to create a reliability analysis, the collection of descriptive statistics and inter-correlations.

## 4 RESULTS

### 4.1 Results – Study 1

With regard to the drivers that favor long-term use of a DSA, the students clearly see the topic of data protection in the lead (Table 3). 21 core sentences were assigned to the category of data protection, putting this category clearly at the top of the rankings ahead of second place. It is important to the students that their data is not passed on and that the collection of data by the DSA is tied to a specific purpose and that this purpose is not subsequently extended. A privacy by design approach was also suggested in this context, in order to take data protection into account as early as the development stage. Transparency was taken up in a total of nine key phrases. In this category, the respondents emphasized that it is important to them how their data is handled and also how and by which algorithms the study assistant arrives at its results or generates information.

In third place, with seven core sentences each, are autonomy and data security. The category autonomy is described by the students as control over functions, information control and the possibility of being able to decide as freely or autonomously as possible. Data security is distinguished from data protection in these categories in that it describes protection against

external attack or intrusion. Data protection, on the other hand, primarily describes protection against the transfer of data outside the system. The last rank is fairness, in this case with five core sentences. This outlines that the DSA should not favor or discriminate against anyone and should be available to all students for free use.

Table 3: Ethical Drivers.

Question group	Selection of mentioned core sentences	Number of assigned core sentences	Category
Ethical drivers for usage	Protected content to which only selected individuals have access; privacy by design; the study assistant should not share the data; protection of individual data.	21	Data privacy
	Transparency of how the collected data is used; transparency and consent when the DSA proposes something, publishing of the program code.	9	Transparency/ Informed consent
	User control over functions; own influence on selection and presentation of information; independent decision making.	7	Autonomy
	Securing data against loss and third-party access; protection against hacking; high data security.	7	Data security
	No preference in proposals; no discrimination; opportunity for use by all students.	5	Fairness

After the drivers, the barriers are considered next in Table 4. Data privacy, which took first place among drivers, is now also represented in first place among barriers, with 18 core sentences. The students surveyed considered the greatest barrier to using the

DSA to be the disclosure of personal data or even uncertainty about this issue. They clearly stated here that lack of privacy would be a strong criterion for not using the study assistant.

Table 4: Ethical Barriers.

Question group	Selection of mentioned core sentences	Number of assigned core sentences	Category
Ethical barriers against usage	Disclosure of personalized data to third parties; uncertainty that own data would not be handled properly, data privacy concerns; no purpose limitation of data..	18	Lack of data privacy
	No freedom of decision; no sufficient control; autonomous assumptions of the system; optimization to norm study time.	10	Violation of autonomy
	Request of too much personal data; no anonymity given; accumulation of personal data.	6	Lack of (data) anonymity
	Possibility to use not given to all students; have a lead that non-users don't have.	4	Unfairness
	System could be hacked; lack of data security	4	Lack of data security

In second place with ten core sentences is the category violation of autonomy. According to the students surveyed, a lack of freedom to make decisions, not having sufficient control, or feeling forced into a role would be a barrier to use. Lack of anonymity ranks third with six core sentences. According to the respondents, this relates to the request for too much personal data or when anonymity should not be given. Fourth place among the barriers is shared by the categories unfairness and insufficient data security. A barrier to use is seen when the DSA acts unfairly, i.e. users have an

advantage over non-users or not all students can/are allowed to use it. Another barrier seen by students is insufficient data security, which could, for example, lead to the DSA not being able to withstand an external attack. The following ethical value categories, which were derived from the drivers and barriers serve as the basis, for the second survey in study 2. **Data Privacy/Anonymity:** Due to a great overlap in the students' statements, the categories of drivers and barriers of data privacy and the barrier lack of (data) anonymity were merged. A distinction between the two categories was not expected by the students. In today's information age, privacy is one of the main concerns in society and research (Johann and Maalej, 2013). Privacy is understood as the ability and/or the (legal) right of an individual person or group to seclude themselves or information about them from third parties. With regard to the protection of information privacy, this means that personal data is secured against unauthorized access (data security) and also that only an authorized group of people is granted access to this data (data privacy) (Ienca et al., 2017). **Fairness:** Particularly concerning digital inclusion, this category represents a core value for ensuring that as many people as possible from different backgrounds can participate in and use digital technologies (Kernaghan, 2014). Fairness here means the equal distribution of opportunities, rights, goods through technology and equal access to a technology (Ienca et al., 2017; Steinmann et al., 2015). **Autonomy:** This ethical value refers to the possibility (in this case through technology) that people are free to decide, plan and act as they wish in order to achieve self-determined goals (Friedmann et al., 2013). The term autonomy also often refers to self-determination. Related to the ethical context of DSA, this means that students are granted the opportunity to act in a self-determined and autonomous manner (Keber and Bachmeier, 2019). This includes freedom through third-party monitoring, supervision, and categorization (Cohen, 2000). **Data Security:** (Data) Security refers to protection against destruction or theft of information structures and data by unauthorized third parties. It is often referred to as IT security, computer security, and information security (Gasser, 1988). **Transparency/Informed consent:** Transparency here refers to the disclosure and communication of functions and ways of data processing of the DSA. Informed consent refers to the consent of students to the use of their (personal) data, including its revocation. It should be noted that comprehensive information about the nature and use of the data must be provided beforehand (Keber and Bachmeier, 2019). Consent must be given voluntarily

after the person has been informed of the possible effects and risks. If possible, this consent should be given in text form or by a clear statement of consent (Wright, 2011).

## 4.2 Results – Study 2

In the first step, the quality criteria of the questionnaire are explained before the descriptive results and the correlations are discussed. To ensure the content validity of the questionnaire, the focus group was first used to assign and reduce items. The subsequent pre-test with students also contributes to ensuring that the understanding of the items is as consistent as possible, thus ensuring inter-subjectivity. For the reliability analysis in form of an internal consistency test, Cronbach's alpha was calculated. The internal consistency of a Cronbach's alpha = .84 can be considered as satisfying.

First, the descriptive findings are examined and classified with regard to the first research question. As mentioned above, after closing the survey, we transformed the results to obtain metric data for calculation. Accordingly, the highest achievable value for the agreement of the ethical statements represents 5 and the lowest is 0. The transition from a single minus (-) to a single plus (+) is seen as the level at which the students agree with the thesis at least to a small extent. Consequently, a mean value of 2.6 represents the lowest possible level of agreement. The standard deviation (SD) for the ethical value categories is between 0.7 and 0.9, indicating a low degree of dispersion. Table 5 shows the mean values and the associated standard deviations for the ethical value categories, which are discussed below. Furthermore, the table presents the ranking of the categories from study 1 for comparison. First of all, it should be noted that there was a level of agreement on all categories of ethical values by the students. As described above, this agreement would already have been reached with a mean value of 2.6. However, since each category reached at least a value of  $M = 3.5$ , it can be assumed that the students as a whole attach a certain relevance to them.

**Fairness:** The respondents in the survey consider the category fairness ( $M = 4.3$ ,  $SD = 0.8$ ) to be the most important ethical value. Thus, students see the fairness of the digital study assistant as the most important factor with regard to the consideration of ethical values. Access to the DSA should be made equally available to all students, including all user groups, and treat them equally. In addition, respondents also explicitly stated in one item that a perceived unfairness of the system would lead

students not to use it. **Transparency/Informed consent:** This ethical value category is close behind with a mean of 4.2 and a standard deviation of 0.9 comes in second place as an important ethical value. Here, students expect the DSA to inform them in detail about the use and processing of their provided data. Furthermore, no data should be used or shared for any purpose other than that declared without the explicit consent of the user. The third rank is shared by three ethical value categories with a mean value of 4.0. These can thus still be interpreted as important ethical values with regard to the research question.

Table 5: Comparison Study 1 and Study 2.

Results Study 2			Results Study 1	
Ethical value category	M	SD	Characteristic	Rank
Fairness	4.3	0.8	Driver	4 <sup>th</sup>
			Barrier	4 <sup>th</sup>
Trans- parency/ Informed consent	4.2	0.9	Driver	2 <sup>nd</sup>
Data Privacy/ Anony- mity	4.0	0.9	Driver	1 <sup>st</sup>
			Barriers	1 <sup>st</sup> ; 3 <sup>rd</sup> *
Data Security	4.0	0.9	Driver	3 <sup>rd</sup>
			Barrier	4 <sup>th</sup>
Autonomy	3.5	0.9	Driver	3 <sup>rd</sup>
			Barrier	3 <sup>rd</sup>

$n = 156$ ,  $M = \text{mean value}$ ,  $SD = \text{standard deviation}$

\*separate rankings before category were merged

**Data Privacy/Anonymity:** The category data privacy/anonymity achieved a mean value of 4.0 with a standard deviation of 0.9. With this result, respondents confirm that privacy is highly important to them in a digital study assistant and that it would be a criterion for non-use if the DSA did not respect their privacy. Students would also care about the purposes for which their data would be used within the system. **Data Security:** In the same line, (data) security also achieved a mean value of 4.0 and a standard deviation of 9.0. Here, students indicated that (data) security is a high priority for them and if they had security concerns with the DSA, they would not share data with the system. Respondents also indicated that the issue of data security was not overrated within the context of a DSA. The following categories safety, accountability, and autonomy did



Table 6: Correlations of the Ethical Value Categories.

	Fairness	Transparency/ Informed consent	Data Privacy/ Anonymity	Data Security
Fairness				
Transparency/Informed consent	.35			
Data Privacy/Anonymity	.33	<b>.56</b>		
Data Security	.34	<b>.64</b>	<b>.71</b>	
Autonomy	.46	.33	.27	.37

not reach the necessary minimum value of  $M = 4.0$  to be considered important but are nevertheless briefly examined below. **Autonomy:** The lowest mean value in this survey was reached by autonomy with  $M = 3.5$ , which can nevertheless still be evaluated as clear agreement due to the Importance of this ethical value.

The students agree that they are given freedom to make personal decisions in planning their studies, for example. In the course of evaluating the results, correlations of the ethical value categories were also carried out. Table 3 above shows the correlations of the ethical value categories, with the high correlations (Pearson) above .50 shown in bold. The highest inter-correlation found was between privacy and (data) security with .71. This result suggests that privacy and (data) security are considered very similarly by the students surveyed, meaning that a clear line between these two categories may not be valid.

It might be useful, also in terms of item reduction, to merge these two categories or try to formulate them more distinctly in the future. The second highest correlation between the categories of ethical values was found between (data) security and informed consent (.64). In this case, as well, it can be assumed that there is at least a partial overlap between the two categories. The situation is similar with the privacy and informed consent categories. Here, the inter-correlation of the two categories is .56. It seems that there is thus a triangular relationship between the three categories privacy, (data) security, and informed consent. It was already noted in the focus group and the pre-test that these are in fact quite similar, but that there is a clear distinction between these categories. There was also a correlation of .46 between fairness and autonomy. A possible explanation for this could be that autonomy could pick up on a partial aspect of fairness. Here it could be useful to specifically look for connections between the contents of these two categories.

## 5 DISCUSSION

The results show that all the ethical categories surveyed are attributed a certain importance by the students. Especially with the second study, these categories should be differentiated with regard to their importance. However, it can be stated here that at most marginal differences were found, which makes it difficult to assess the most important ethical value categories. In addition, the categories all

achieved at least a mean value of 3.5 (autonomy), which is equivalent to a range between + and ++ on the Likert scale. Therefore, all underlying categories are considered important for the use of a DSA from the student's point of view. Although, as mentioned above, it is difficult to provide a clear hierarchy of the importance of the ethical values, the significance of the individual results will be discussed below. The results point out that four of the five value categories appear particularly important to the students, as these have a mean score of 4.0 and higher.

Here, the **fairness** of the DSA represents a fundamental ethical value from the perspective of the students surveyed. This study showed that students do not accept that the DSA is perceived as unfair and that this can lead to non-use. In the first study, fairness was mentioned both as a driver and in negative form as unfairness as a barrier. In both cases, the fourth rank was reached in accordance to core sentence mentions. In the second study, fairness was ranked first with a mean value of 4.3. It is thus interpretable that fairness is perceived as more important if it is explicitly named as an ethical value in advance. In contrast, fairness seems to play a less important role when students reflect unbiased about drivers and barriers of an DSA. To address fairness, DSA developers could consider in preliminary stages the areas in which fairness conflicts may arise. It is important to identify exactly what is perceived as unfair and to take preventive measures accordingly.

The open questions in the first study pointed out, for example, different treatment of different groups of people are seen as unfair. Here, too, it is not yet clear exactly what characteristics (e.g. gender, nationality or course of study) can be linked to this. One way to address for example nationality, in the interest of fairness, is to design a DSA in a multilingual fashion. Thus, foreign students have an equal understanding of functions and recommendations of a DSA and can therefore use it more effectively.

Respondents also have a clear opinion regarding **transparency and informed consent**. They want transparency and also be informed about the use of their data and expect that this also sets the framework for actual data use. Students also see it as an important factor that they give informed consent for the use of their personal data. The results show that transparency and consent are also perceived as inextricably linked by the respondents. This category was exclusively named as a driver in study one and was represented here in second place. In the second study, transparency/informed consent received a mean value of 4.2 and thus also achieved second place. For developers and operators of DSAs, it is therefore important to clearly communicate the use of the data and also to obtain the consent of the user group in advance. If possible, it could also be considered to make the corresponding source code publicly available to create maximum transparency and traceability of the DSA.

In this context, it can be noted that **data privacy/anonymity** also has an important role to play with regard to personal data. Data privacy ranks first in study 1 for both barriers and drivers, making it the most important ethical value for students in relation to a DSA in this case. Within the qualitative content analysis in study 1 it was found that the core sentences of insufficient data privacy and the lack of (data) anonymity have great overlaps. Thus, for study 2, the values of data privacy/anonymity were combined. In the second study, a mean value of 4.0 is subsequently achieved. Concerns about violating the data privacy/anonymity of study assistant users could be addressed in several ways. Data Privacy governs how data is collected, shared and used. Students clearly express the concern that their data could be shared with third parties and used for other purposes as stated. In this context it became obvious, that this category overlaps with data security and transparency/informed consent, which is also highlighted in the correlations. Persons responsible for the DSA should receive regular training on data privacy so that they understand the processes and procedures required to ensure the proper collection,

sharing and use of sensitive data as part of a general data management portfolio. The data management portfolio plays a crucial role not only in the data privacy/anonymity category, but also in the data security category. When developing a digital study assistant, care should be taken to preserve the anonymity of the students. Therefore, those responsible for the DSA should clarify which data is really important so that the DSA can be used effectively. Identifying characteristics which are not necessary should be negated from the data sets in this context to ensure the desired anonymity of the students. A similar situation occurs with the **data security** category. Data security ranks third among drivers and fourth among barriers as an ethical value for using a DSA. Insecure systems, hacking, and fear of losing one's data were particularly highlighted by students in study 1. In the second study, data security is also rated as very relevant with a mean value of 4.0. To ensure high standards of data security, data protection measures and access controls must be in place to ensure that only those with the appropriate access rights can view the data. Likewise, steps must be taken to protect the data from loss or destruction, for example through regular data backups or a firewall to protect against external access. In this context, the creation of a detailed data security concept according to University policies and the current law also plays a central role in preventing hacker attacks.

**Autonomy** was ranked third as an ethic driver and barrier in study 1. In the second study, this category dropped noticeably compared to the others, achieving only a mean score of 3.5. Here it can be assumed that autonomy do not seem to be of great importance to the students. One possible explanation is, that students are willing to sacrifice part of their autonomy in order to receive advice from the study assistant, even if this is perceived as patronizing. It is also interesting to look at the individual items of autonomy. Respondents are more likely to agree on the importance of autonomy than on the consequence of not using the DSA if their autonomy is restricted. This result should be interpreted cautiously, however, as a mean of 3.5 can still be considered a clear agreement on the importance of autonomy from the student perspective. In order to counteract the impression that DSA could limit the autonomy of students, there is quite a bit that can be done on the developer's side. With regard to wording, it is advisable to ensure that proposals are not made in a patronizing or commanding tone. Also, too intrusive reminders and categorization of students should be avoided in order not to create reactance among users.

Ideally, students will see the DSA as a helpful tool, which is proactive, but still discrete, respectful and accepts personal decisions. It is not surprising that the categories transparency/informed consent, privacy, and data security are highly correlated with each other, as already stated in the category data privacy/anonymity. The correlations indicate a strong connection between these categories. Simplified it can be said that students want to know what happens to their data, expect that the declared purpose of the data use will be adhered to, and attach great importance to the protection of their data from theft or third-party access.

## 6 CONCLUSION & FUTURE WORK

In this article, two studies were combined in order to examine important ethical values perceived by students in the context of a DSA. For this purpose, five ethical value categories were first derived by study 1 via free text answers. Afterwards 156 students were surveyed with regard to these categories in study 2. This paper is intended to provide initial indications of which ethical values are particularly important to students when using a DSA and what should be taken into account when developing such a system.

This work can be understood as a first step towards incorporating concepts of ethical values or VSD into the development of digital assistance systems for students. It is not intended to claim completeness of the ethical values, nor does this research explicitly search for reasons or possible implementation methods. This opens up interesting perspectives for further research in the field of higher education in general and research on digital study assistants in particular. A next logical step would be to investigate the implementation of ethical values in a DSA. In other words, how does the system manage to address and consider the ethical values of students? Furthermore, follow-up research with students who are actual using the DSA in their daily study routine would be interesting and would offer further insightful implications for researchers and practitioners. Developers and decision-makers can use this paper as a basis for their decision to include ethical considerations in the development of systems that are used by students and to take their ethical values into account.

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