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A Research of the Operational Status of Information-Education Programs for the Elderly Individuals in Korea, Using Correspondence Analysis

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Abstract: Korea ranks at the top of the ICT sector evaluation index by country, such as Internet penetration rate and speed, but at the same time, aging is rapidly progressing. In order to prevent problems such as a digital divide and information alienation that can occur in such a society, there is an increasing need for information education for the elderly. The purpose of this study is to identify the information education program classification and level preferred by that generation by surveying current information-education programs for those aged 50 and over. To achieve this aim, we surveyed and organized information education programs in Seoul, and with the help of experts and the elderly, derived the classification and level of each program. Based on this, a correspondence analysis was conducted. The results of this study showed that Microsoft Office Master and Information Technology Qualification (ITQ), Computer basics and ITQ, Excel, and PowerPoint, constitute the basic level of information education; photograph and image editing, ITQ, and computer literacy constitute the general level; and web publishing, the Internet of Things, data processing and robotics, and IT professional training make up the expert level. Based on the findings of the present study, we were able to suggest a direction for information-education programs for the elderly.

Keywords: informatization, elderly, information education, correspondence analysis

The importance of informatization has further increased with the spread of computers and smartphones in the 21st-century society. In particular, informatization is taking place more actively with the emergence of the fourth industrial revolution, as presented in the 2016 World Economic Forum (WEF). Toffler (1980) divided human history into three waves. The First Wave is agricultural society after the Neolithic Revolution and the Second Wave is Industrial Age society by Industrial Revolution. The Third Wave is called the Information Revolution (Informatization Revolution), in which Toffler (1980) stated that the class with information would emerge as the new ruling class while other classes will become
the neglected classes, making information access and usage capabilities important in the information age (Ministry of Science and ICT & National Information Society Agency, 2020).

Modern society is also an aging society. According to the 2017 Population and Housing Census (Statistics Korea, 2017a), South Korea’s rate of aging is currently the fastest in the world. The country became an aged society one year earlier than expected, with 14.2% of the population reaching the elderly category in 2017. South Korea first joined the ranks of aging societies in 2000 in just 17 years—seven years earlier than the previous shortest period (24 years) it took among the advanced countries to change from an aging society to an aged society: 24 years for Japan, 45 years for the United Kingdom, 69 years for the United States, and 115 years for France (United Nations, 2017). South Korea is expected to become a superaged society in 2025 (Statistics Korea, 2017b).

In such an aged society, the digital divide between generations may increase with the aging of middle-aged people who have less experience using digital devices. Other causes of the digital divide include the fact that they did not receive information education or, even if they did receive such education, their acquisition ability might be low (Kim et al., 2007). The greater the influence of the access and use of information in real life, the greater the possibility that their information alienation might lead to a corresponding alienation from society and not just inconvenience in everyday life. According to a survey of the digital divide, the digital informatization level of adults aged 55 years or older nationwide was 63.1%, which means that the level of access, capability, and use of digital information for older adults was less than 65%, whereas the overall level for the general public was 100% (National Information Society Agency, 2019). This is the lowest level among the four vulnerable social groups with respect to informatization: people with disabilities, people in the low-income bracket, farmers and fisherfolks, and older adults. On the other hand, when the level of informatization was examined with the location limited to Seoul and middle age was defined as 50–64 years, the elderly group was found to have significantly higher levels of access, capability, and use of information compared to adults 55 years or older (Kang et al., 2018).

The Purpose of the Study

This means that elderly people should be provided with appropriate education because they have a high capability to acquire various information education. Even then, the digital divide needs to be resolved through various information education efforts to prevent the elderly from the alienation that can occur due to the faster progression of aging coupled with lower levels of informatization than other generations. Therefore, it is necessary to support the elderly to actively use information and communication technology and smart media devices so that they can contribute to coexistence between generations, expanding participation in economic activities and social participation. In addition, it is important to systematically plan, design, and provide curricula considering the needs and levels of the elderly and to establish an administrative, budget, and organizational support system to support them (Seoul 50 Plus Foundation, 2019). Currently, various information education is provided for the elderly, but because there has not been any research on what kind of education programs and institutions they actually prefer, this needs to be supplemented through research.

As the definition of middle age is different depending on the study, the present study defines middle age as being between 50 and 64 years of age. Information education should be provided before people enter into older brackets because the proportion of not only the elderly but also middle-aged individuals is increasing.

Accordingly, the following research questions were set: First, what are the information education programs preferred by the elderly? Second, how does the level of the programs differ according to the classification of information-education programs preferred by the elderly? To that end, the level of programs was analyzed using correspondence analysis according to the classification of information education programs provided to them. The derived findings are expected to be used as useful basic information when future information-education curricula are designed at the national level.

Analysis of Previous Research

In the early stages, information education for the elderly focused on living and adapting to modern
society. Accordingly, it dealt mainly with helping equip them with the basic content, methods, and computer-usage abilities essential in modern South Korea (Kim et al., 2017). However, information education from now on should advance one step further from the simple acquisition of computer skills and include various topics such as Internet access and use, methods of using content, and methods of using and digitally acquiring necessary real-life information (Lee, 2015). In addition, the concept of information education should be expanded to include education on teaching and sharing knowledge and skills generally needed to use not only computers but also digital devices such as smartphones, tablets, laptop PCs, and GPS systems due to their growing popularity in recent years. Because the technology is expected to be further subdivided by device and level, information education should likewise be conducted in more finely subdivided and diverse areas in the future.

The law related to information education is the Framework Act on National Informatization (2019). According to the law, national agencies and local governments should make efforts to improve the quality of life of community residents, seek balanced development among regions, and resolve the digital divide (Article 16). To that end, they should conduct education to resolve the digital divide (Article 35). In particular, the Framework Act on National Informatization (2019) stipulated that the aged are the target for education on the digital divide, and the types of education are basic education regarding computers and the Internet, education for use, and others that are recognized as being needed. As such, the digital divide education that is extended from the older age bracket to those who are middle-aged corresponds to the education required at the national level.

In addition to the national mandate, there are benefits to information education at the individual level, such as that education can be a supplementary means to their social activities (Wu et al., 2015). Information education also gives vulnerable social groups in the information-oriented society an equal opportunity at the national level, and this is very important for knowledge-based nation-building. In the welfare dimension, the expansion of the informatization base through the improvement of information competence among the elderly, who represent a major population in the rapidly aging society, means that a substantial portion of the citizenry has received the respect and attention it deserves.

As such, the information education of the elderly is conducted with the goal of closing the digital divide and improving their quality of life. However, according to the operation and management guidelines for the collective information education of information-alienated groups by the National Information Society Agency (NIA), which leads to information education at the national level, the main purpose of information education is to bridge the digital divide, and the primary education method is collective education. Such collective education at the national level is hosted by the NIA at various educational centers chosen with consideration given to accessibility and educational facilities, including senior welfare centers, cultural centers, city, county, and community centers, social welfare centers, and continuing education centers. The majority of information education is related to the use of the Internet and word processing at a basic level, centered on simple methods of use.

In addition, there are senior IT volunteers—participants in an IT volunteering activity—engaged in knowledge sharing in which social participation and digital competence sharing are possible. These volunteers help improve the ability of the elderly who have excellent information literacy but are unable to participate or have difficulty participating in the information society to use IT more freely. In 2018, the “Senior ICT Leader Project” was implemented (National Information Society Agency, 2019) to reduce the negative effects of decreased economic vitality due to rapid aging and the retirement of the baby boomer generation, which now belongs to the new elderly. Its members are highly educated and IT-friendly. The project is composed of leaders 55 years or older who have IT expertise and participate in social activities such as information education, content creation, and IT equipment management for vulnerable social groups using IT online and offline. Senior ICT Leaders conduct information education related to new technologies such as coding, drones, and virtual reality (VR) because it requires expertise compared to the Senior IT volunteers. In addition to the central government, each local government, including Seoul Metropolitan City, also provides various information education programs for the elderly. For example, Seoul Metropolitan City (2019) listed on its website that Seoul had invested about KRW 830 million for
information education in 2019, and each autonomous district conducts information-education programs. However, most information education offers only a basic level of education.

Prior research on information education has mostly focused on proving the results and effectiveness of education (Choi, 2013), but research on the present status of information education has been lacking. Accordingly, the present study examined the areas and level of the information curriculum for the elderly that are most frequently opened and operated, and attempted to determine the direction that information education should be heading in the future, considering the curriculum and level of information education.

Methods

Research Targets

Seoul, where information education is most actively offered nationwide, was chosen as the subject city. The research was conducted on 50+ campuses and 50+ centers offering information education to the 50+ generation, along with vocational schools, private institutes, women’s resources development centers, lifelong education centers, and associations that can be verified on the HRD-Net as offering an information-education curriculum. Institutions that offered information education curriculum to those 50 years or older from January 1 to August 31, 2018, were used as the subjects, and the total number of institutions that corresponded to this description, excluding institutions with no information education curriculum during the period, was 104.

Research Instruments

To examine the information competence currently provided to the elderly to strengthen this area in the future, we surveyed, examined, and classified the curricula related to the informatization of Seoul through discussions with three experts. A total of 60 programs were identified through this process. Based on the classification of the programs, the appropriateness of the classifications was examined through a workshop with 12 adults over age 50 and three experts. Furthermore, similar program categories among the organized program classification categories were integrated, and the final number of program categories was set to 25. For example, among the curricula, UCC, blogs, and YouTube were classified as “SNS.” From our classifications, we produced a program classification table consisting of 1,123 information education curricula, including course titles and contents. In addition, the final information education curriculum table was created by asking research participants to classify the level of education curriculum into “Basic,” “General,” or “Expert,” and to reclassify the 1,123 information-education curricula according to these three curriculum levels. Basic means a basic process, such as Office Automation course, which is a process related to basic requirements for information services as a non-qualification process. General means a process for producing results and general qualification by utilizing application software as a qualification process. In addition, Expert is a specialized course that applies IT technologies such as development and web programming.

Research Procedure

The step-by-step research procedure is as follows. First, the current status of the information-education curriculum was identified through research on the HRD-Net home page listed January 1 to August 31, 2018, completed about people aged 50 years or older. Second, the identified informatization programs were initially classified through a review of three information education experts such as the head of an information education and training institution for the elderly, instructors who have taught information education for more than 20 years. Third, the program classification was reviewed and reclassified through a workshop attended by 12 adults over 50 who completed an information-education program and three information education program experts, who together reassigned and reclassified the 1,123 information-education curricula to one of the three levels. Fourth, we used the SPSS statistical program to analyze the reclassified and reassigned data.

Data Analysis

Basic and correspondence analyses were performed based on reclassified and reassigned curriculum data. Correspondence analysis used in the present study was an analysis method for determining the association or correspondence among variables by representing relationships among categorized variables as a series of rows and columns and then visualizing them into
dots in the low dimensionality spaces (Bendixen, 1996; Hair et al., 1998). This analysis was selected to respond to the curriculum level according to the classification of informatization programs. Correspondence analysis is relatively free from basic assumptions (Clausen, 1998), unlike other statistical methods, except for the basic assumption that the variables must be nonmetric variables. (An example of correspondence analysis is that labor market performance can be investigated and then responded to according to employment type or wage level, depending on the training institution. Thus, the relationship between training institutions and labor market performance can be visually examined.)

Results

Correspondence Analysis Between Program Classification and Level

Partition Table

The relocated program response frequency is presented in a two-dimensional contingency table in Table 1. The classification of reclassified information education program is presented as the row heading in the leftmost column, and the curriculum levels are presented as the column headings of Basic, General, and Expert in the topmost row of the table. As shown
in Table 1, of a total of 19 smartphone programs, eight, four, and seven programs were recognized as Basic, General, and Expert, respectively. In terms of program classification by level, 546 curricula were Basic, 361 curricula were General, and 216 curricula were Expert. The total number of information education curricula was 1,123.

**Row and Column Profiles**

Each frequency is converted into a row profile and a column profile, a ratio system, as shown in Table 2 and Table 3, to easily interpret the frequency of the partition table. The row profile is the relative ratio obtained by dividing the total number of information-education programs surveyed by program classification. For example, if the total number of programs related to office automation is 24 and the number of curricula in the General level is 11, the value of the row profile is $11/24 = .458$ (45.8%). The sum in the rightmost column is 1, which is the sum of all the profile values in the row. The row-profile average in the bottommost row represents the average of each row value. In addition, each profile value is a mathematical vector represented by a dot in space, and the closer the profile values in

### Table 2

**Row Profile**

<table>
<thead>
<tr>
<th>Program Classification</th>
<th>Basic</th>
<th>General</th>
<th>Expert</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone</td>
<td>.421</td>
<td>.211</td>
<td>.368</td>
<td>1.000</td>
</tr>
<tr>
<td>SNS</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Photo and image editing</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Microsoft Office master</td>
<td>.935</td>
<td>.065</td>
<td>0.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

<Part of row profile content is omitted>

<table>
<thead>
<tr>
<th>Program Classification</th>
<th>Basic</th>
<th>General</th>
<th>Expert</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Office automation</td>
<td>0.000</td>
<td>.458</td>
<td>.542</td>
<td>1.000</td>
</tr>
<tr>
<td>Professional license</td>
<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>IT professional training</td>
<td>0.000</td>
<td>.167</td>
<td>.833</td>
<td>1.000</td>
</tr>
<tr>
<td>Average row profile</td>
<td>.486</td>
<td>.321</td>
<td>.192</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3

**Column Profile**

<table>
<thead>
<tr>
<th>Program Classification</th>
<th>Basic</th>
<th>General</th>
<th>Expert</th>
<th>Average Column Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone</td>
<td>.015</td>
<td>.011</td>
<td>.032</td>
<td>.017</td>
</tr>
<tr>
<td>SNS</td>
<td>0.000</td>
<td>.036</td>
<td>0.000</td>
<td>.012</td>
</tr>
<tr>
<td>Photo and image editing</td>
<td>0.000</td>
<td>.014</td>
<td>0.000</td>
<td>.004</td>
</tr>
<tr>
<td>Microsoft Office master</td>
<td>.212</td>
<td>.022</td>
<td>0.000</td>
<td>.110</td>
</tr>
</tbody>
</table>

<Part of column profile content is omitted>

<table>
<thead>
<tr>
<th>Program Classification</th>
<th>Basic</th>
<th>General</th>
<th>Expert</th>
<th>Average Column Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application software engineering</td>
<td>0.000</td>
<td>0.000</td>
<td>.440</td>
<td>.085</td>
</tr>
<tr>
<td>Security</td>
<td>0.000</td>
<td>0.000</td>
<td>.019</td>
<td>.004</td>
</tr>
<tr>
<td>Office automation</td>
<td>0.000</td>
<td>.030</td>
<td>.060</td>
<td>.021</td>
</tr>
<tr>
<td>Professional license</td>
<td>0.000</td>
<td>0.000</td>
<td>.144</td>
<td>.028</td>
</tr>
<tr>
<td>IT professional training</td>
<td>0.000</td>
<td>.003</td>
<td>.023</td>
<td>.005</td>
</tr>
<tr>
<td>Total</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Column masses</td>
<td>.486</td>
<td>.321</td>
<td>.192</td>
<td></td>
</tr>
</tbody>
</table>
two rows, the closer each dot to each other in space. Because variables located close to each other have a high similarity in their attributes, their locations are clustered when they are visualized in space (Ivy, 2001; Han et al., 2006).

The column profile is the relative ratio obtained by dividing the total number of variables of each information education program classification by the level. For example, when the total number of programs related to office master is 124, and the number of curricula corresponding to the General level is eight, the column profile value in the corresponding column is \( \frac{8}{124} = 0.065 \) (6.5%). The values of the column masses in the last row are the same as the average row profile values, and the column profile averages in the last column are identical to the average values of each row profile value.

**Determination of Dimensionality**

Dimensionality in correspondence analysis is the value obtained by subtracting one from the smaller number of rows or columns. Because the number of columns in the present study was three, the basic dimension was considered to be two (Hair et al., 1998; Han et al., 2006). To obtain a more accurate number of dimensions, however, the eigenvalues and cumulative variances that are used in factor analysis were reviewed. In addition, the level of explanatory power of the variance in actual data was also determined. However, due to the small number of columns, the scree plot test was excluded. When dimensionality is two, as shown in Table 4, the explanatory power is considered to be high only if the explanatory power of dimensionality two is 70% or higher (Koo, 2007; Lee et al., 2017), and the explanatory power of variables in the present study reached 100%, which showed sufficient significance of the relationship between the dimensions. Accordingly, the data of the present study were presented in a two-dimensional space for simplicity of presentation and ease of interpretation.

**Perceptual Map**

As shown in Figure 1, the perceptual map that visualizes the profiles of rows and columns is yet another method of showing relationships between rows and columns. The perceptual map visualizes the strength of relationships between each program classification and level type, as expressed by the Chi-square value. If the measured value is larger than the expected value, the level of similarity (signed Chi-square) becomes positive, so the program classifications and level types represented by the dots will be close to each other. In contrast, if the measured value is smaller than the expected value, the relationship becomes negative, and the location of the dots of program classifications and level types will be farther from each other.

The perceptual map is created based on the relationship strength of these values, and the recognized level of each program classification is represented as the perceptual map presented in Figure 1. According to the perceptual map, Microsoft Office master (4), Information Technology Qualification (ITQ) (5), computer basics and ITQ (7), Excel (10), and PowerPoint (11) were among the information-education curricula at the basic level; photo and image editing (3) and ITQ and computer literacy (6) were at the general level; and web publishing (15), Internet of Things (16), data processing (17), robotics (18), and IT professional training (25) were at the expert level. See Table 1 for the classification of each number.

**Table 4**

*Dimensional Analysis Table*

<table>
<thead>
<tr>
<th>Dimensionality</th>
<th>Eigenvalue</th>
<th>Variable</th>
<th>Chi-Square</th>
<th>p-value</th>
<th>Proportion of Variable</th>
<th>Reliability Eigenvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Explanatory power</td>
<td>Cumulative explanatory power</td>
</tr>
<tr>
<td>1</td>
<td>.979</td>
<td>.959</td>
<td>.511</td>
<td>.511</td>
<td>.004</td>
<td>.454</td>
</tr>
<tr>
<td>2</td>
<td>.959</td>
<td>.919</td>
<td>.489</td>
<td>1.000</td>
<td>.006</td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>1.878</td>
<td>2,108.553</td>
<td>.000</td>
<td>1.000</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The need for information education for the elderly is increasing to prevent information alienation that can occur in modern society in which the speed of both informatization and aging is rapidly increasing. Accordingly, even though various information education programs have been provided to the elderly, most studies have been limited to the information education of those in the older age bracket, and there has not been an investigation on the status or level of the information education provided to the elderly bracket. Therefore, the present study examined information-education programs that the elderly are attending, classified the programs by categorizing similar programs, and examined the level of the programs according to their content and purpose to determine the elderly adults’ preferred education programs and levels. To that end, correspondence analysis, which can determine the level of correspondence between programs and levels, was used in the investigation.

The present study investigated information-education curricula that were operated in Seoul for people aged 50 years or older between January and August of 2018, surveying 1,123 information-education curricula of 104 institutions. These curricula were reviewed by members of the 50+ generation and information-education professionals, and 25 types of programs were identified. The 1,123 curricula were reassigned to three levels according to program classifications, and ultimately a perceptual map was created according to the program classifications and levels.

The findings of the present study are as follows. First, there was a total of 25 program classifications of information-education curricula provided to the elderly, as shown in Table 1. When the 25 classifications of programs were grossly categorized into four categories: daily living convenience (2.8%), document writing and editing (77.6%), graphic design (2.8%), and new technology (16.8%), the number of programs corresponding to document writing and editing was 77.6% (871 programs). That is, the majority of the curricula for information education for the elderly were aimed at document writing and editing related. This finding is similar to the findings of a previous study (Seo et al., 2016) that reported that word-processing programs were the highest-attended information-education programs for the elderly, but when educational contents presented in the previous study were reclassified similar to that of the present study, the number corresponding to the convenience of

![Figure 1. Perceptual Map of Program Classifications and Levels](image)
daily living was the highest in operation. Furthermore, the differences between program classifications in the previous study were 25% or less, while the differences in the present study were more pronounced.

Second, the levels of information-education programs for the elderly were classified into three levels: basic, general, and expert. The classifications of programs corresponding to each level were as follows: First, Microsoft Office master, ITQ, computer basics and ITQ, Excel, and PowerPoint were found to correspond to the basic level; photograph and image editing, ITQ, and computer literacy corresponded to the general level; and web publishing, Internet of Things, data processing, robotics, and IT professional training corresponded to the expert level. In the case of the proportion of informatization programs by level, programs corresponding to Basic level amounted to 48.6% (435 programs), which was almost half of the entire program. When the general level was also considered, the combined amount of both types of programs was more than 80%. In other words, information education for the elderly generally consisted of curricula that were at the general or basic level, and expert level programs were at least 1.5 times or twice as complex as the basic and general-level programs. This finding supports the findings of the 2018 Report on the Digital Divide (National Information Society Agency, 2019), which reported that the level of digital informatization of adults aged 55 years or older nationwide corresponds to 63.1% of the general public. In the case of the survey of the 2018 Report on the Digital Divide, it is difficult to consider the information competence of the elderly to be low because the older age group whose informatization is weaker than that of the elderly was included in the report. In particular, the 50+ generation in Seoul who were targeted in the survey of information education curriculum have a very high level of information access, competence, and use compared to older adults nationwide (Kang et al., 2018).

Suggestions

The suggestions of the present study are as follows: First, the proportion of education that teaches knowledge and describes the technologies needed to use various new digital devices that are being used currently and will be emerging in the future should be increased because the information-education programs currently offered tend to overly focus on document writing and editing.

Second, at present, information education is mostly conducted at the basic level, but the level of education should be subdivided in the future according to the devices and technologies, and in the case of the expert level, long-term curricula are needed for the sequential development of competence. In addition to the long-term curricula, the existing curricula and next curricula should be linked, depending on the time period of the curriculum offered.

Third, research on the current status and demand of information education programs should be actively reflected when future information-education curricula are designed and implemented. Reviewing various informatization policies and programs planned and carried out for the elderly in accordance with their preferences will not only provide them with an appropriate information education curriculum but will also satisfy their expectations and enhance their quality of life.

Implications

The major significance of the present study was that it was the first to investigate the degree of correspondence level of information-education programs for the elderly. In addition, the present study is significant for conducting research on the elderly because the majority of previous studies have focused on the effect of information education for the elderly, and only a few studies have investigated the status or condition of information education; few studies in this research area have been limited to the elderly. The present study also has significance for its ability to inform and thus improve the direction of information education for the elderly, whose numbers are increasing proportionally and will thus require more of the budget as informatization and aging progress. This will help experts in developing and implementing information education curricula with program classification and levels by more actively reflecting the perspectives of the elderly.

The present study has its limitations in that it surveyed the status of the information education program only in the Seoul Metropolitan City, and the investigator was not able to identify the personal
attributes of the beneficiaries of the information-education programs, despite the fact that the preferred information education program is expected to differ depending on personal attributes. Accordingly, demographics need to be added in future studies, and comparative research regarding the match between supply and demand of information education programs should be conducted.

Declaration of ownership:

This report is our original work.

Conflict of interest:

None.

Ethical clearance:

This study was approved by the institution.

References


